

WILDFIRE MANAGEMENT AND RESTORATION

Overview: *Wildfire is a natural occurrence on Utah’s landscapes. Many plants and animal species, including Greater Sage-grouse, evolved in an environment having cycles punctuated by natural wildfire. While Sage-grouse can adapt and even benefit from some fires, disruptions in the natural fire cycle, encroachment of conifers and the presence of exotic annual grasses such as cheatgrass have presented new challenges. Changes in wildfire frequency and intensity are raising concerns about the cumulative impact of these fires within some of the state’s Sage-Grouse Management Areas (SGMAs). The state of Utah invests millions of dollars into programs to proactively address wildfire concerns including (1) prevention, (2) suppression (including rapid response to wildfire in SGMAs) and (3) rehabilitation/restoration to areas affected by wildfire. Utah’s Conservation Plan for Greater Sage-Grouse follows the best available science on ameliorating the threat of wildfire on Greater Sage-grouse habitats.*



Affected SGMAs: Box Elder, Bald Hills, Sheep Rock Mountains, Hamlin Valley and Ibapah.

Wildfire Management Strategies Matter for Sage-Grouse

Wildfire is an important area of emphasis for Greater Sage-grouse conservation in the state of Utah. Utah’s Conservation Plan for Greater Sage-Grouse (the “Conservation Plan”) indicates, “Habitat loss due to fire and replacement of (burned) native vegetation by invasive plants is the single greatest threat to Greater Sage-grouse in Utah. Immediate, proactive means to reduce or eliminate the spread of invasive species,

particularly cheatgrass after a wildfire, is a high priority.”

These concerns are also reflected in the U.S. Fish and Wildlife Service 2010 Rule which found that Greater Sage-grouse was “warranted but precluded” from listing. The Rule specifically addressed the threat of wildfire:

“Many of the native vegetative species of the sagebrush-steppe ecosystem are killed by wildfires, and recovery requires many years. As a



Figure 1 - An airtanker drops retardant in Utah pinyon/juniper wildfire.

result of this loss of habitat, fire has been identified as a primary factor associated with Greater Sage-grouse population declines (citations omitted)...In nesting and wintering sites, fire causes direct loss of habitat due to reduced cover and forage (citation omitted)."

Suppression costs have exceeded one billion dollars in each year since 2000 and reached \$1.7 billion in 2013¹. Western wildfires are not only costly to suppress but also can degrade the value of vegetative communities and working landscapes. These impacts can substantially affect Greater Sage-grouse. Research suggests that changes in wildfire frequency are directly linked to encroachment of conifers and proliferation of exotic annual grasses such as cheatgrass (*Bromus Tectorum*) into sagebrush ecosystems. The U.S. Department of Agriculture's Rocky

Mountain Research Station explains how high density conifer stands can lead to landscape scale wildfire:

"Extreme burning conditions (high winds, high temperatures, and relatively low humidity) in high density (Phase III) stands are resulting in large and severe fires that result in significant losses of above- and

below-ground organic matter (sensu Keeley 2009) and have detrimental ecosystem effects (Miller et al. 2013) Strategic and targeted treatments to reduce these risks can help land managers protect key habitats and preserve underlying Sage-grouse population dynamics to reduce the risks of wild fire."²

The persistence of invasive exotic annual grasses like cheat grass in the Great Basin provide fine-scale fuels which increase the propensity for fires, even from natural sources such as lightning. This not only shortens the intervals between fires, but also increases the overall acreage burned in a typical fire. When combined with increased fuel loads from encroaching conifer woodlands, the risk of catastrophic wildfire in sage-brush ecosystems has increased substantially.

¹<http://www.usatoday.com/story/weather/2014/07/23/western-wildfires-climate-change/13054603/>

² "Using resistance and resilience concepts to reduce impacts of invasive annual grasses and altered fire regimes on the sagebrush ecosystem and Greater Sage-grouse: A strategic multi-scale approach"

How Wildfire Affects Sage-Grouse

To develop comprehensive strategies to address the threat posed by wildfire, it is important to understand how wildfire impacts Sage-grouse populations. There are four fundamental ways in which wildfire impacts Sage-grouse:

1. Destruction of sagebrush and other desirable food sources
2. Proliferation of exotic annual grasses which compete with desirable food sources including forbs, native grasses and sagebrush
3. Increased frequency and severity of wildfires due to presence of fine-scale fuels from cheatgrass and other exotic annual grasses.
4. Fragmentation of habitat by creating areas which are not suitable for Sage-grouse populations

In 2013, a team of representatives from U.S. Fish and Wildlife Service and various Sage-grouse states met to develop recommendations for reducing or ameliorating threats to Greater Sage-grouse and their habitats. The Greater Sage-Grouse Conservation Objectives: Final Report, which resulted from those meetings in February 2013, addresses concerns related to wildfire and post-wildfire affects:

“Fire (both lightning-caused and human-caused) in sagebrush ecosystems is one of the primary risks to the Greater Sage-grouse, especially as part of



Figure 2 – Sage-grouse chicks take advantage of a restoration area during summer brood-rearing period. Insects form an important part of the Sage-grouse diet during this important growth period.

the positive feedback loop between exotic annual grasses and fire frequency.”

In other words, these experts reiterate the nexus between exotic annual grasses are resulting in increased frequency of wildfires.

Cheatgrass proliferation following wildfires is an area of particular concern in low-lying xeric areas which correspond with warm and dry soil regimes. Unlike higher elevation, cool and moist areas, not only are these areas more prone to repeated wildfire, but xeric areas are less responsive to restoration of native forbs, grasses and brush species. These areas also tend to correlate more closely with nesting/brood rearing and high priority winter habitat.

The Conservation Plan is investing in solutions to address these challenges. In fact, the Utah Watershed Restoration Initiative and its partners

have spent tens of millions of dollars to restore hundreds of thousands of acres affected by wildfires, both within and outside of Utah's SGMAs. For more information on Utah's efforts to address cheatgrass proliferation refer to the Utah Sage-Grouse Conservation Strategy for Cheatgrass.

Proven Strategies for Wildfire

Wildfire experts and Sage-grouse biologists in Utah are working together to develop cooperative strategies to address the threat of wildfire. The primary objective of these strategies is to protect sagebrush habitats from wildfire. It is much easier to increase resiliency of Sage-grouse habitat by promoting the health of sagebrush ecosystems before the sagebrush is burned. After sagebrush is burned restoring or rehabilitating areas post-wildfire can be difficult and expensive. This is particularly true of Sage-grouse breeding and winter range.

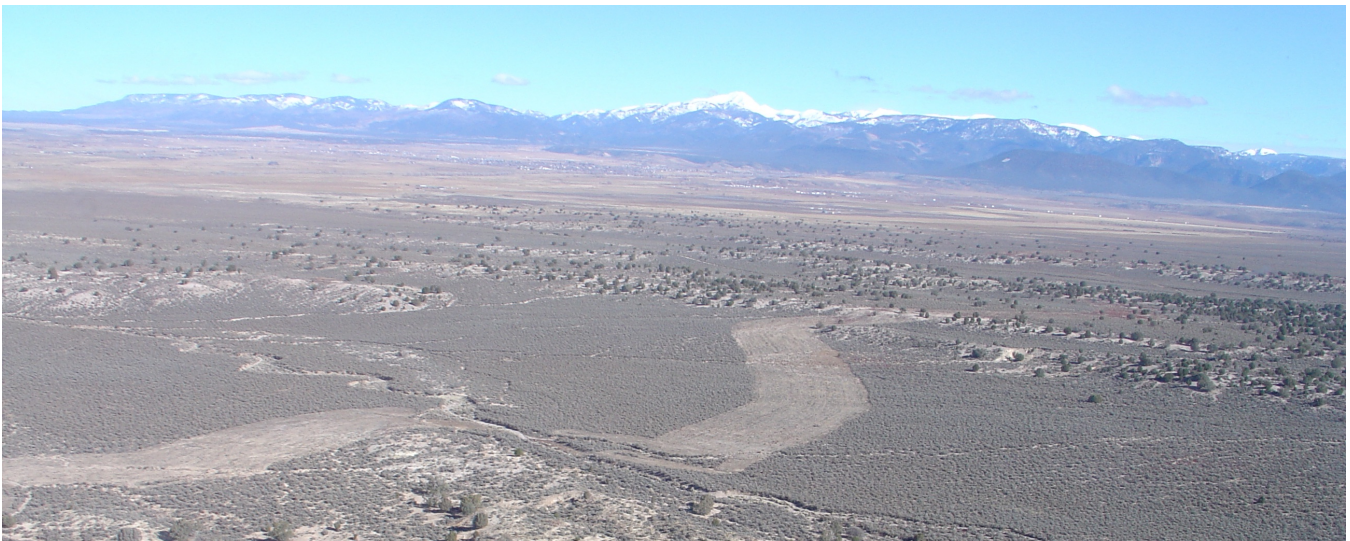
If sagebrush is destroyed by wildfire, the process of natural vegetative succession can take years before healthy native sagebrush plant

communities are fully restored. Additionally, the moisture and temperature conditions needed for successful reseedling of sagebrush restoration may only occur once every 5-10 years, or even more infrequently. This is why money spent on prevention and suppression strategies makes good economic sense. Prevention not only protects sagebrush by reducing the number and frequency of new fires, but can also help reduce the size of fires that do start. This saves millions of dollars that would otherwise be spent on controlling wildfires and additional millions restoring habitats after a wildfire.

By utilizing specific criteria and the best-available science, Utah has developed a comprehensive strategy and detailed plan to address threats presented from wildfire and post-wildfire effects. Utah's approach not only addresses threats to habitat from wildfire, but utilizes methodology which ensure these habitats work for Greater Sage-grouse.

This methodology is explained by the Sage-grouse National Technical Team's publication "A Report

Figure 3 – When healthy landscapes are combined with fuels reduction and green stripping shown below, sagebrush ecosystems are more resistant to wildfire.



UTAH SAGE-GROUSE CONSERVATION STRATEGIES

on National Greater Sage-grouse Conservation Measures” dated December 21, 2011:

“These programs address the threats resulting from wildfires and post-wildfire effects along with a program (fuels management) designed to try to reduce these impacts. Together these programs provide a significant opportunity to influence sagebrush habitats that benefit Sage-grouse...it is critical not only to conduct management actions that reduce the long-term loss of sagebrush but also to restore and recover burned areas to habitats that will be used by Sage-grouse (Pyke 2011).”

Utah’s Conservation Plan focuses on a three-pronged approach for addressing the threat of wildfire.

1. Prevention, including:
 - a. Fuels management/reduction strategies and
 - b. Fire-zone buffers such as green stripping and fire breaks.
2. Suppression strategies, including:
 - a. Prioritizing at-risk habitats,

- b. Providing rapid response strategies and
- c. Fire control resource allocation.

3. Post-fire habitat restoration and rehabilitation efforts to:
 - a. Restore desirable vegetation and
 - b. Control undesirable species such as cheatgrass

Prevention

Money spent on prevention results in significant cost savings when compared with fire suppression and rehabilitation efforts. Additionally, prevention is the best way to preserve sagebrush and intact habitats. Prevention is one of the most important parts of Utah’s Sage-grouse conservation strategy for wildfire. Prevention involves a combination of fuels reduction and creation of buffers to help control wildfires that do occur. The use of fuels reduction strategies and creation of natural buffers are proven solutions which help increase resiliency of sagebrush habitats.

Fuels reduction, has become increasingly important in view of encroachment of pinyon and juniper species along with proliferation of exotic

Figure 4 - Conifer removal projects allows sagebrush understory to flourish while providing restoring resilience of ecosystem to wildfire.



annual grasses. Removing pinyon/juniper and exotic annual grasses can help control both the frequency and severity of wildfires. The state of Utah invests millions of dollars into pinyon/juniper removal projects every year. Utah's Sage-grouse conservation strategy includes detailed plans for removing encroaching pinyon/juniper from sagebrush habitats. Conifer removal is an important part of strategies to ameliorate the threat of catastrophic wildfires. For more information on Utah's conifer removal efforts refer to the Utah Sage-grouse Conservation Strategies report on Pinyon/Juniper Removal for Proactive Habitat Restoration.

Most strategies for direct removal of exotic annual grasses are either unproven or experimental in nature. However grazing and post-fire reclamation efforts are proven methodologies to help control exotic annual grasses and in particular cheatgrass. Grazing can help immediately reduce the volume and contiguous nature of exotic annual grasses. Post-wildfire reclamation efforts are also vitally important to control proliferation of cheatgrass. Treatments in the state of Utah to control proliferation of cheatgrass will be discussed in greater detail hereinafter.

Suppression

Utah has a strong-track record of wildfire suppression. 98% of wildfires are stopped before they burn 1,000 acres. Not only do small sporadic fires have minimal impacts to Sage-grouse habitats, some research has found that when the cumulative impact of smaller fires is not excessive, they can actually be helpful to Greater Sage-grouse:

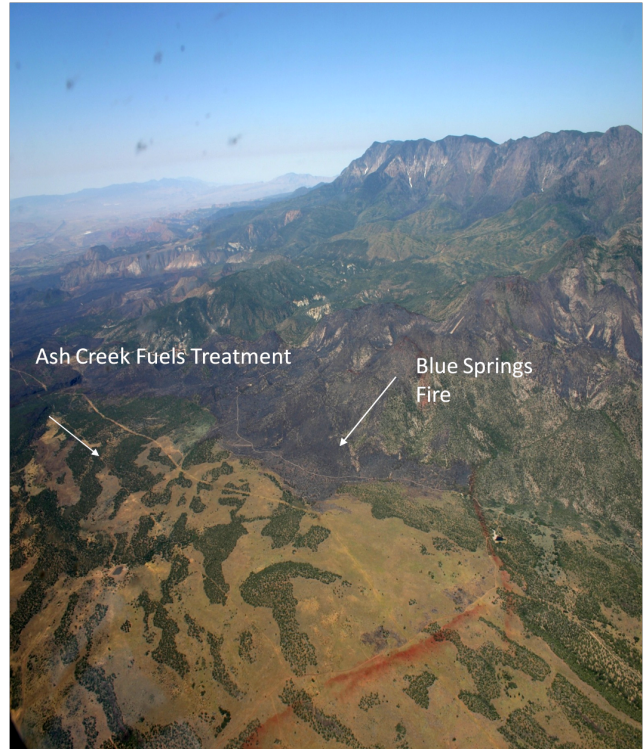


Figure 5 - Conifer removal projects provided important fire breaks which allowed crews to stop progression on blue Springs Fire saving thousands of acres of habitat.

“Small fires may maintain suitable habitat mosaic by reducing shrub encroachment and encouraging understory growth...Sage-grouse using burned areas...may preferentially use the burned and unburned edge habitat.”³

Utah's fire suppression strategy objective is to suppress all wildfire within Sage-grouse management areas with the goal of restricting or containing wildfires in these areas to the normal range of fire activity. Sage-grouse is prioritized below human life and protecting infrastructure and communities. Utah's response strategies are evolving as additional information is learned about wildfire within key Sage-grouse habitats.

Utah's rapid response strategy not only involves cooperation between federal, state and county

³[U.S. Fish and Wildlife Service 2010 Rule]

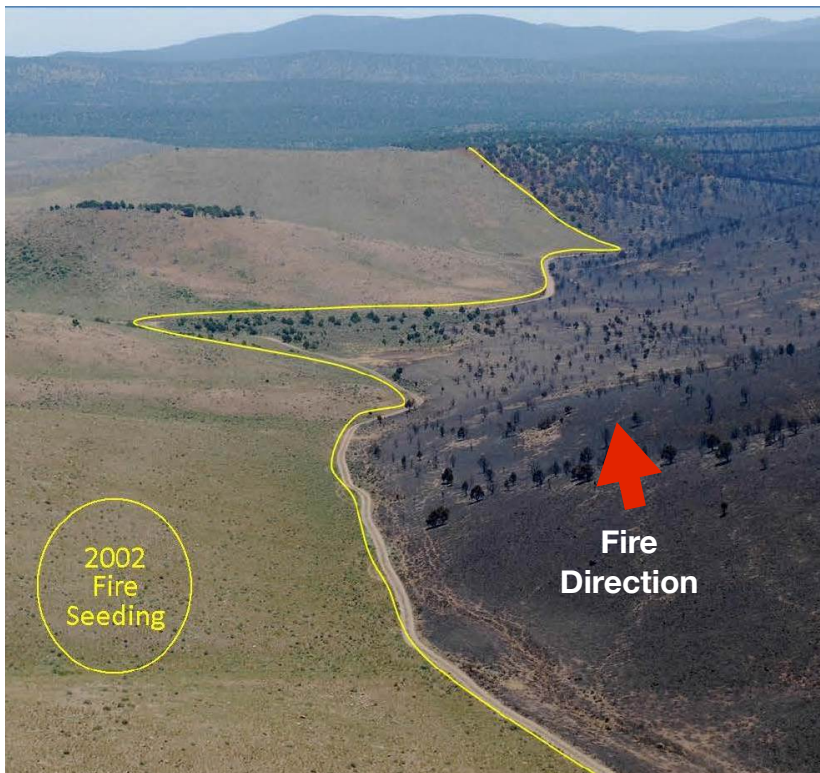


Figure 6- During critical drought conditions thousands of acres were saved from the fast moving Black Mountain Fire by a previous reseeding project of the Utah Watershed Restoration Initiative.

and fire suppression entities, but also prioritizing resource allocation based on threat potential within and outside of at-risk SGMAs. Where resources are limited, Utah's wildfire suppression strategy provides a stepped prioritization:

1. Highest priority areas within highest priority SGMAs
2. Prioritization amongst at-risk SGMAs
3. All SGMAs
4. Any identified connectivity corridors between SGMAs
5. All sagebrush habitats.

Utah's conservation strategies stress the importance of utilizing mechanical removal strategies within sagebrush ecosystems to

eliminate prescribed burns of breeding and winter habitats. This not only protects sagebrush from unnecessary long-term removal, it ensures that treatment areas are suitable for utilization by Greater Sage-grouse after treatments are completed.

Restoration and Rehabilitation

The dependent relationship of cheatgrass and wildfire underscores the importance of not only prioritizing prevention and suppression strategies for SGMAs which are most susceptible to both wildfire and cheatgrass proliferation, but also restoration and rehabilitation

strategies after a wildfire. Post-fire strategies for cheatgrass involve chemical or biological pre-emergents which actively suppress cheatgrass growth combined with reseeding of desired grasses, forbs and brush. Not only can these efforts promote the restoration of desirable

"The return on investment from this one wildfire alone potentially saved millions of fire suppression dollars and clearly shows how healthy ecosystems are likely to thrive when post fire rehabilitation efforts are implemented successfully."

—PAUL BRIGGS, DISTRICT FUELS PROGRAM MANAGER

vegetation, but help control cheatgrass proliferation after a wildfire.

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Before a wildfire, cheatgrass is approximately 1% of the understory vegetation in areas that have not previously burned. In the absence of wildfire, native grasses, forbs and brush help control cheatgrass. When wildfire occurs, cheatgrass is often the first plant to emerge, often at much higher densities than before the fire. In this way, the biology of cheatgrass is designed to compete with other plant species in response to wildfire.

One specific strategy utilized in the state of Utah is proving to be very effective to control cheatgrass proliferation. After a wildfire, a chemical pre-emergent, which is specific to cheatgrass, is applied to the area burned by wildfire. The area is then reseeded with native (and in some situations non-native) forbs, grasses and brush. Because the pre-emergent is specific to cheatgrass, the reseeded area can begin growing during the year in which the cheatgrass is artificially suppressed. In subsequent years, the reseeded area which has previously begun to take effect results in a head-start for forbs, grasses and brush growth compared to cheatgrass. In most cases, a second application of the cheatgrass specific pre-emergent is not required. While a temporary increase in cheatgrass density may occur in the second year, by the third year cheatgrass returns to lower densities within the understory vegetation.

The data is showing that this strategy not only helps control cheatgrass proliferation, it helps maintain cheatgrass densities to levels that minimize the impact on Sage-grouse utilization of habitats. Just as important, by re-establishing desired vegetative communities, natural processes of plant succession can be restored. This helps ensure that these areas can be fully restored with desired forbs, grasses and sagebrush in ways that will support Greater Sage-grouse populations.



Figure 7 – Sage-grouse actively utilize winter habitats which have healthy sagebrush populations.

The Report on National Greater Sage-grouse Conservation Measures is consistent with Utah's approach on these post-wildfire restoration approach:

“Use of native plant seeds for [Emergency Stabilization and Rehabilitation] seedings is required based on availability, adaptation (site potential), and probability of success (Richards et al. 1998). Where probability of success or native seed availability is low, non-native seeds may be used as long as they meet Sage-grouse habitat conservation objectives (Pyke 2011). Re-establishment of appropriate sagebrush species/subspecies and important understory plants, relative to site potential, shall be the highest priority for rehabilitation efforts.”

Through implementation of proven prevention, suppression and rehabilitation strategies, the state of Utah is addressing challenges presented by wildfire, post-wildfire effects including cheatgrass proliferation.

Utah's Investment to Address Wildfire

The state of Utah has a track record not only of investing in prevention, suppression and rehabilitation, but also ensuring treatment areas work for Greater Sage-grouse. Since the year 2006, Utah has treated 560,000 acres of habitat through its watershed restoration initiative and in cooperation with other partners. A large percentage of these projects directly address threats of wildfire to Sage-grouse habitats. Utah's strategies utilize the best available science on the relationship of a number of factors, including:

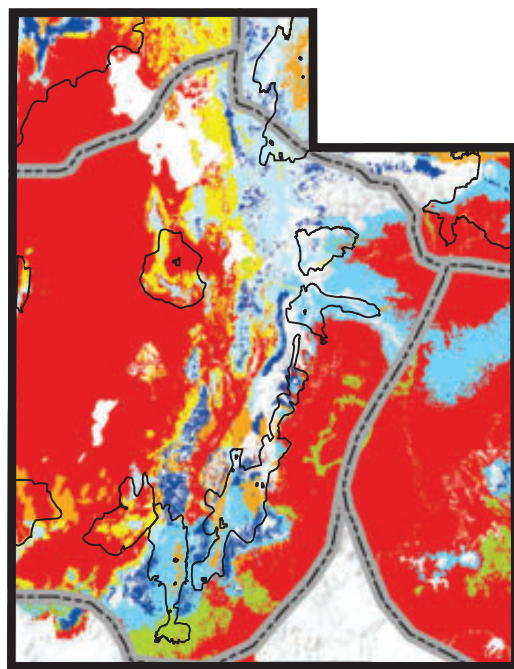
1. Sagebrush habitats
2. Sage-grouse utilization of those habitats
3. Soil temperature and moisture regimes
4. Likelihood of rehabilitation/restoration success

Using these and other criteria, experts in the state of Utah are able to assess areas where additional pre-suppression projects would provide the most benefit. This information also helps inform prioritization suppression and rehabilitation efforts.

Utah's systematic approach follows the suggested management practices of the Natural Resource Conservation Service's Sage-grouse team which encourages criteria-based methodology, "Natural Resource managers are seeking coordinated approaches that focus appropriate management actions in the right places to maximize conservation effectiveness (Wisdom and Chambers 2009; Murphy et al. 2013)."

The state of Utah has systematically identified the Sage-grouse Management Areas where there is heightened risk of wildfire and post-wildfire effects. Many of Utah's SGMAs are not at heightened risk of wildfire and post-wildfire effects. A comparatively small percentage of these areas have been burned by wildfire during the last 20 years.

Other SGMAs not only are impacted by wildfire, but are also at a heightened risk of post-wildfire effects. These areas have a higher overall percentage which have been burned by wildfire. Additionally, these SGMAs have large areas with soil temperature and moisture regimes that are more susceptible to cheatgrass proliferation. These areas also contain areas that are more difficult to successfully reseed for native forbs, grasses and brush. This is particularly true of the



Soil Moisture & Temperature Regime

- Cold (Cyrlic)
- Cool and Moist (Frigid/Ustic)
- Cool and Moist (Frigid/Xeric)
- Warm and Moist (Mesic/Ustic)
- Warm and Moist (Mesic/Xeric)
- Cool and Dry (Frigid/Aridic)
- Warm and Dry (Mesic/Aridic)
- Omitted or No Data
- Sage-Grouse Management Areas

Figure 8 - Five SGMAs within the Great Basin have a high correlation with warm and dry soil regimes. Soil Moisture and temperature is a primary indicator of wildfire propensity and post-fire effects.

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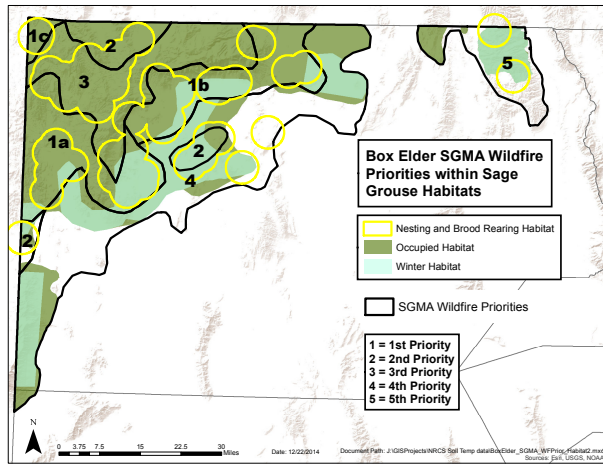


Figure 9 - Wildfire prioritization overlaid with Sage-grouse habitat utilization demonstrates importance of a multi-criteria approach in developing detailed wildfire strategies.

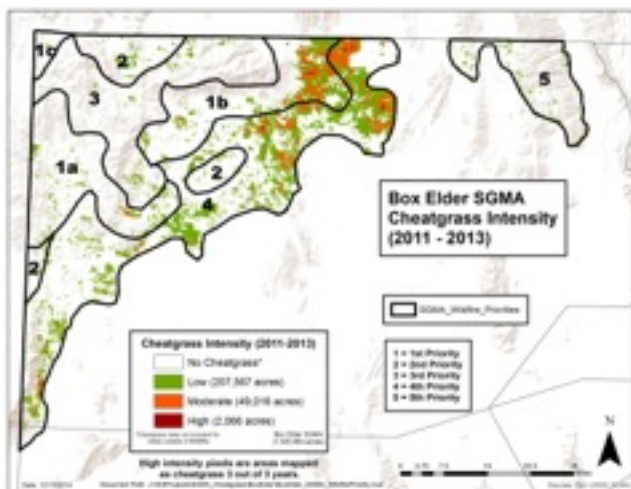
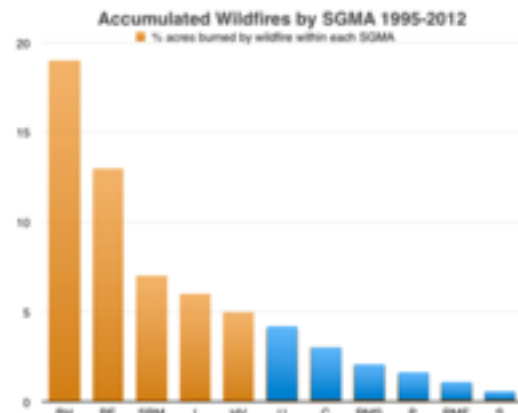


Figure 10 - Cheatgrass intensity is strongly considered when developing wildfire priority strategies within

five SGMAs that lie within Utah's Great Basin. Language in the 2010 "Warranted but Precluded" finding confirms that areas within the great basin are at the greatest risk of wildfire, "Although fire alters sagebrush habitats throughout the greater Sage-grouse range, fire disproportionately affects the Great Basin (Baker et al. in press, p. 20)...and will likely influence the persistence of Greater Sage-grouse populations in the area."

Utah's five SGMAs which lie within the Great Basin include Box Elder, Bald Hills, Sheep Rock Mountains, Hamlin Valley and Ibapah. These five SGMAs hold 26% of the Sage-grouse in the state of Utah. A comparison of these five SGMAs with the 6 SGMAs outside of the Great Basin is helpful. Accumulated acreage affected by wildfire in Utah's SGMAs was closely tracked from 1995-2012.

Utah's five SGMAs within the Great Basin average 10% of sagebrush habitat being burned since 1995. Utah's six SGMAs outside the Great Basin averaged 1.8% of sagebrush habitat being burned in the aggregate since 1995. Not only are the Great Basin SGMAs more prone to large acreage wildfires, they also include large areas with soil types which are more prone to infiltration and persistence of cheatgrass and other exotic annual grasses.



Utah proactive strategies are addressing the threat of wildfire to Greater Sage-grouse habitats. In particular, prioritization of prevention, suppression and rehabilitation efforts are directly addressing challenges presented by wildfire, conifers and cheatgrass. Multiple reseeding of these areas is often beneficial to take advantage of intermittent years where soil temperatures and moisture are favorable for sagebrush restoration.

Detailed Conservation Strategy for SGMA Priorities

Box Elder



Overview

Detailed conservation strategies demonstrate that protecting sage-grouse from the threat of wildfire in Box Elder SGMA is achievable. Spatial threat analysis illustrates that utilizing a priority system for prevention treatments and rapid response strategies in difficult fire years can reduce the acreage burned by wildfire by up to 75% in the areas which are key to survival of 98% of the birds in the Box Elder SGMA. Considering that the Box Elder SGMA holds approximately twice as many sage-grouse as the combined populations of the Ibapah, Sheep Rocks, Hamlin Valley and Bald Hills

SGMAs, a detailed conservation strategy for the Box Elder SGMA is important for protecting Sage-grouse from the threat of Wildfire in the state of Utah.

Detailed Analysis

Every Fire Every Year

In most years, every fire within the Box Elder SGMA can be suppressed before growing too large. In fact, analysis of wildfires from 1995-2012 in Utah's SGMAs shows that 98 percent of wildfires are extinguished in less than 1,000 acres and 99.7 percent of wildfires are extinguished in less than 10,000 acres. In 16 out of 18 years, no wildfire exceeded 10,000 acres and relatively few overall acres burned in the Box Elder SGMA. However, in two years, 2005 and 2007 several large fires burned extensive acreage in the Box Elder SGMA. In 2008, the state of Utah responded with increased funding to enhance prevention and suppression efforts to address the



Figure 11 - Chambers et al wildfire map. Red and black polygons represent acreage burned by wildfire from 1995-2012 in Box Elder SGMA.

UTAH SAGE-GROUSE CONSERVATION STRATEGIES

threat of wildfire in Box Elder and other portions of the state.

Difficult Fire Years

Utah utilizes a three-pronged approach as a key part of its detailed conservation strategy to address the challenge of presented by wildfires to sage-grouse in extreme conditions:

- (1) Prevention: Improving the resiliency of the habitat through conifer removal and control of invasive annual grass before fires start.
- (2) Suppression: Rapid response strategies utilizing priority system for triage situations.
- (3) Rehabilitation: Restoring burned habitat through reseeding and cheat-grass

suppression to ensure burned acreage is returned to sage-grouse habitat.

In the Box Elder SGMA, 1-5 priority zones were developed using historic fire data, soil/temperature regimes, sage-grouse distribution and key habitat types. 1st priority areas 1a and 1b have been designated to further facilitate priority response in the most severe wildfire situations.

Protecting Key Habitat

While the Box Elder SGMA covers 1.5 Million acres, population metrics indicate that nesting/brood rearing habitat and priority winter range for 98% of the birds in the Box Elder SGMA occurs within zones 1a-c, 2 and 3. However, the majority

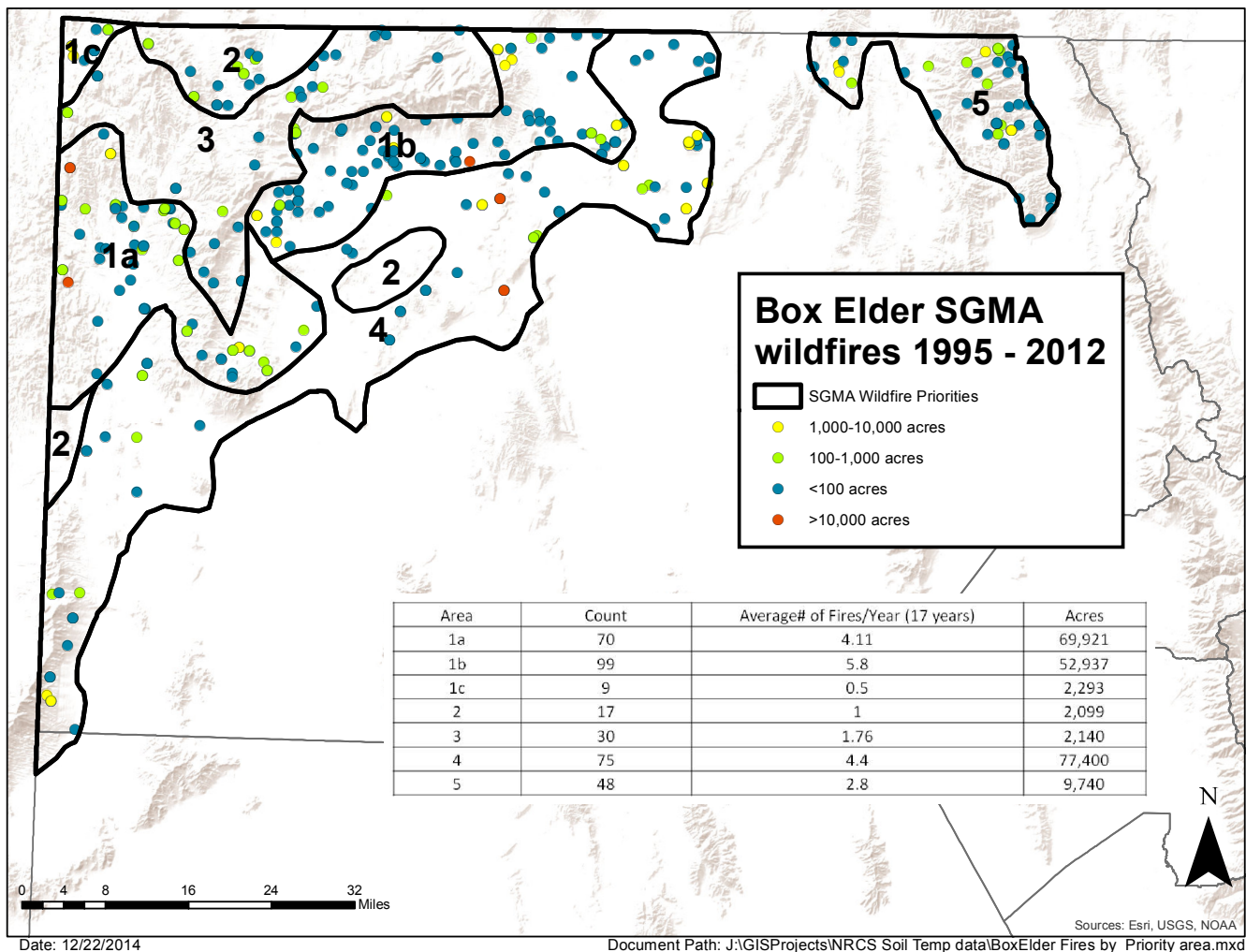


Figure 12-Ensuring fire control in priority areas 1a and 1b during difficult fire years presents an opportunity to reduce acreage burned by up to 75% in critical habitat for 98% of sage-grouse.

of the acreage burned by wildfires in these areas occurs within zones 1a and 1b.

Wildfire not a threat in zones 1c, 2 and 3

Wildfire is not a significant threat in zones 1c, 2 and 3. Soil temperature and moisture conditions within zones 1c, 2 and 3 combined with existing wildfire prevention and control strategies are already sufficient to control wildfires in these areas. In fact, while zones 1c, 2 and 3 cover over 440,000 acres, on average only a collective 363 acres burn in these areas per year. This is likely equal to or less than historical totals. In other words, any threat of wildfire in areas 1c, 2 and 3 is already being controlled to acceptable thresholds. Because zones 1c, 2 and 3 provide nesting/brood

rearing habitat for 55% of the Sage-grouse in the Box Elder SGMA it remains an important priority for wildfire prevention and suppression efforts.

Because cheatgrass favors Xeric and Aridic soils, and due to the fact that cryic, frigid-xeric and frigid-aridic soils are predominant in zones 1c, 2 and 3, cheatgrass and other annual grasses are much less likely to become problematic in burn areas. Soil moisture and temperature conditions in zone 3 and portions of zones 1c and 2, also allow restoration of healthy vegetation. Using soil moisture, temperature, elevation and other quantified variables, restoration specialists determine whether reseeding or other restoration activities will be helpful. Restoration activities

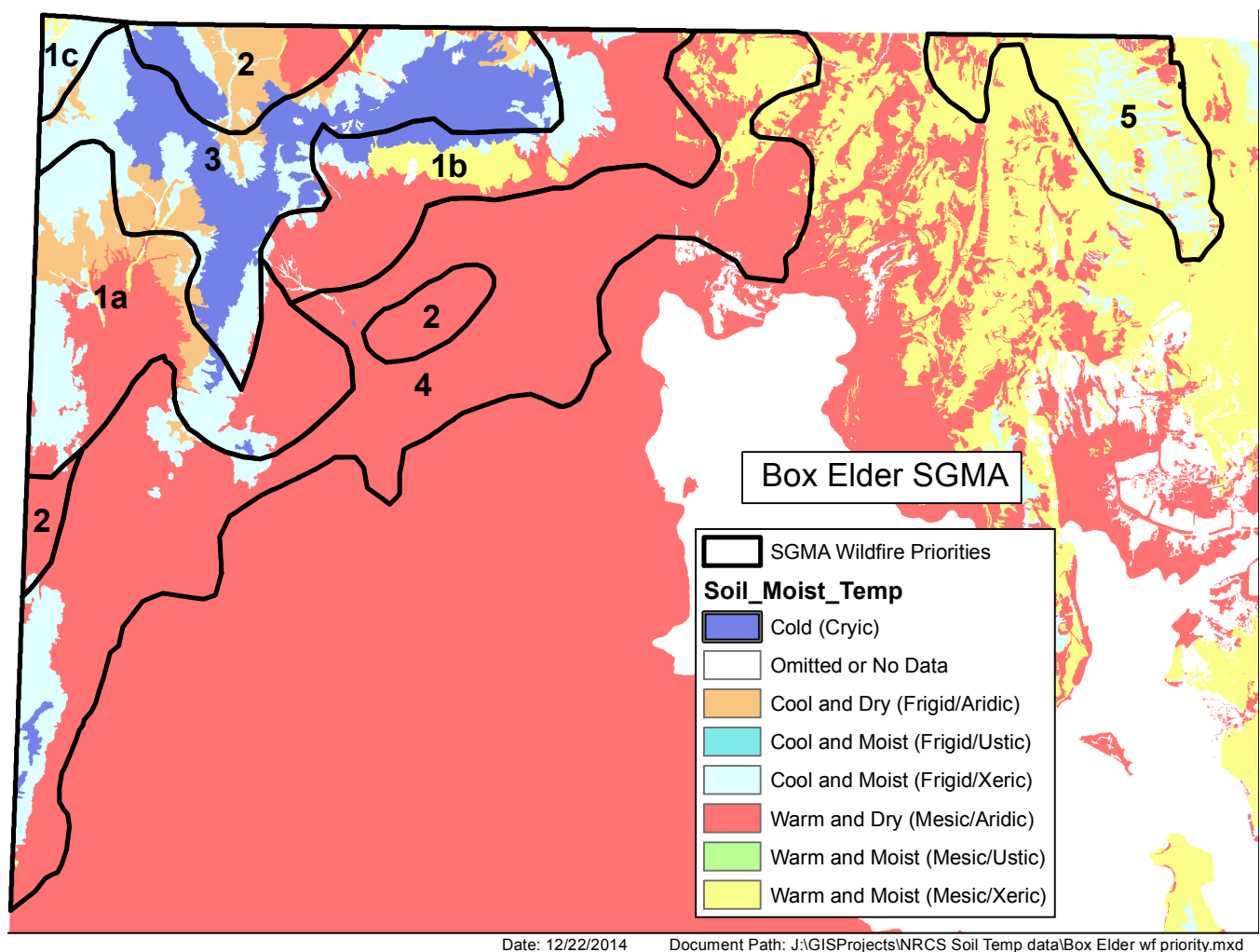


Figure 13-Soil temperature and soil conditions and existing fire management efforts means wildfire is not a threat in zones 1c, 2 and 3. With less than 365 acres per year burning on average in these areas, sage-grouse populations are not at risk.

after wildfire are highly successful and revegetation of desirable forbs, grasses and brush occurs in just a few short years.

Few Birds in Zone 4

Zone 4 provides nesting brood-rearing habitat for just 2% of Sage-grouse in the Box Elder SGMA. Nevertheless, because zone 4 includes general winter range, it is important that it be included in the prioritization system. While there are less wildfires which start in zone 4 than zones 1a and 1b, the total acreage burned by wildfires from 1995-2012 in zone 4 was relatively high. Nevertheless, because of the large amount of winter habitat in the Box Elder SGMA, the amount of acreage impacted by wildfires in zone 4 is not considered limiting for sage-grouse populations. This does not mean that wildfire suppression is not important in zone 4. Instead it reflects the

reality that in triage situations where multiple fires may be burning in severe fire conditions, prioritizing wildfire control in nesting/brood rearing areas and critical winter range in areas 1-3 is a higher priority than general winter range in zone 4. This is because winter range in zone 4 is in more abundant supply and the impact of a large wildfire in zone 4 is less likely to directly impact sage-grouse populations than a large wildfire in areas 1-3.

Analysis of historical wildfire trends suggest that controlling wildfires in area 4 will not typically interfere with wildfire control efforts in areas 1-3. For example, the two largest fires in area 4 occurred in 2005 and 2006 while two largest fires in areas 1a and 1b were in 2007. This demonstrates that the priority system should allow

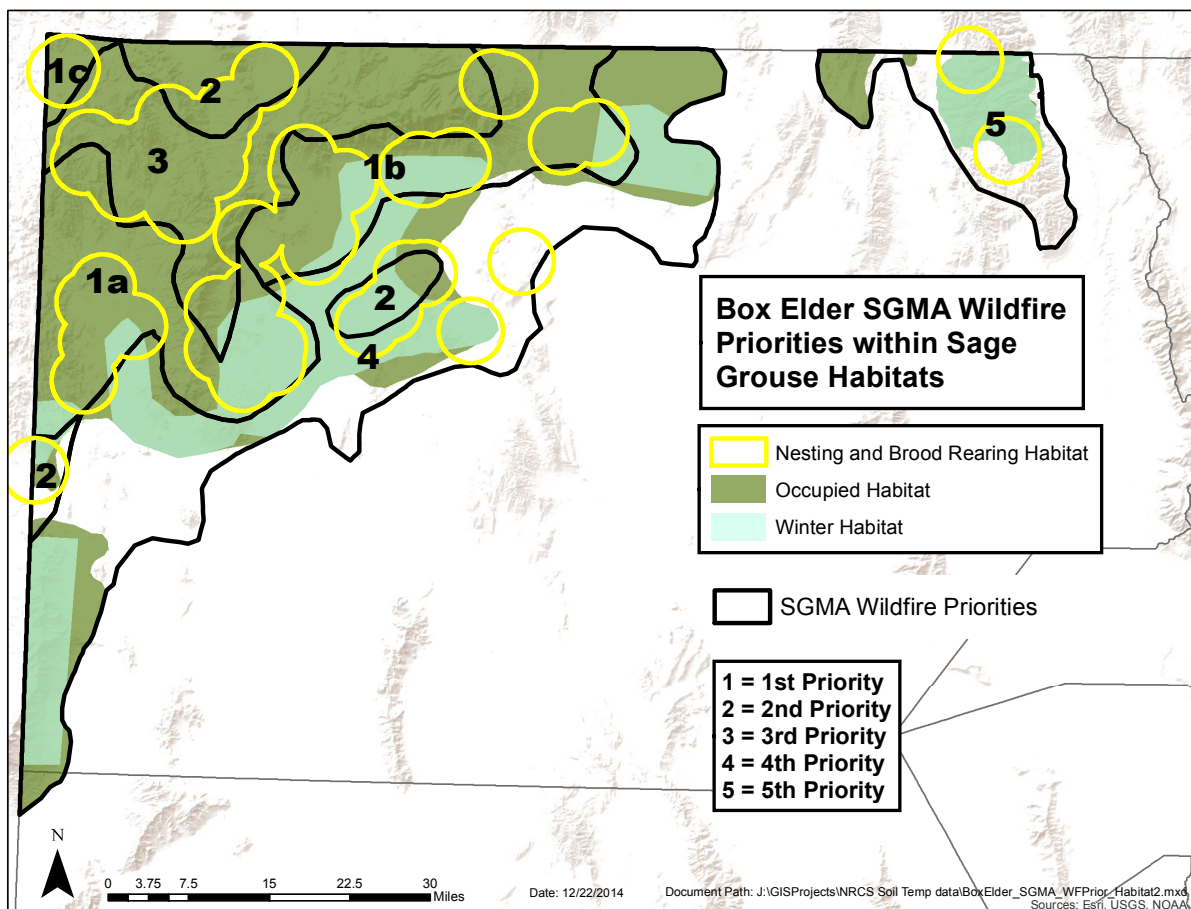


Figure 14-shows that the majority of nesting brood rearing habitat occurs within zones 1-3. Zones 1-3 also contain winter habitat.

protection of general winter range even in difficult fire years.

Detailed Wildfire Strategies for Zones 1a and 1b

Prioritization of zones 1a and 1b is important to inform improved rapid response and suppression strategies in the Box Elder SGMA. While there are few large wildfires in zones 1a and 1b, large wildfires account for most of the acreage burned in these areas. In some respects, this is a function of the soil temperature and moisture regimes, elevation and plant communities, but is also informed by historic wildfire trends. Prioritization reflects the fact that wildfires are not only more likely to occur in zones 1a and 1b, but they are also more likely to burn large amounts of acreage.

Prioritization of zones 1a and 1b inform enhanced prevention and suppression efforts in at risk areas and in habitats within the Box Elder SGMA that are important to Sage-grouse survival. There are multiple ways prioritization can be helpful to suppression efforts in the Box Elder SGMA. For example, if multiple fires start in a single night and

resources become limited, it is helpful to recognize that a wildfire in zone 1a is more likely to become a large than a wildfire in zone 3. Similarly, it is helpful to recognize that a wildfire in zone 1b is more likely to detrimentally impact sage-grouse populations than a wildfire in zone 4.

Most years, all wildfires within the Box Elder SGMA are extinguished before becoming large. In fact from 1995 to 2012, there were no wildfires in zones 1a and 1b which exceeded 10,000 acres in 16 out of 18 years. During these 16 years, wildfires burned just 1,434 acres annually on average within zones 1a and 1b. However, in 2005 and 2007 large wildfires far exceeded these annual averages. For example, in 2005 one fire burned 18,420 acres in zone 1a. In 2007 two fires burned 59,296 acres in zone 1b and four fires burned 12,484 acres in zone 1a. Controlling these fires can reduce acreage impacted by up to 75%.

Enhanced wildfire control in zones 1a and 1b protect nesting/brood rearing and important winter habitats for greater sage-grouse in the Box Elder SGMA. Zones 1a and 1b provide nesting/brood



Figure 15-shows that the number of wildfires within zones 1a and 1b can vary considerably.

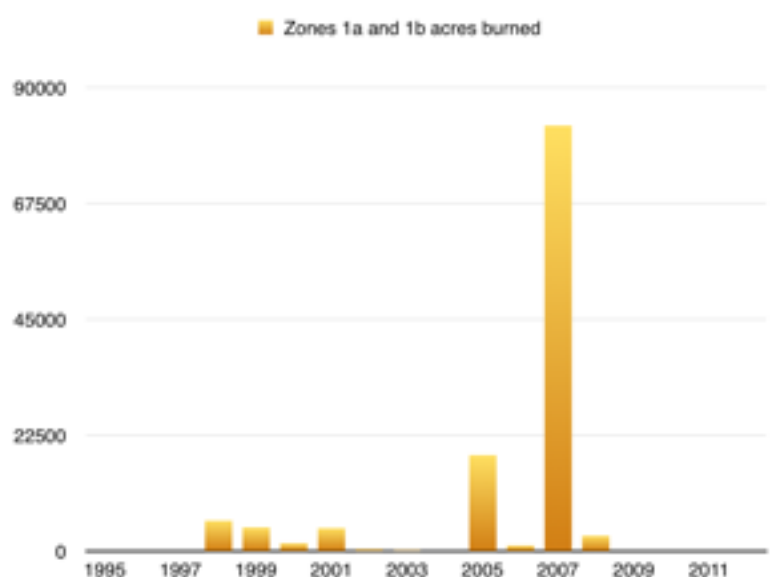


Figure 16-illustrates that severe fire conditions in certain years such as 2005 and 2007 account for most of the acreage burned in the Box Elder SGMA.

UTAH SAGE-GROUSE CONSERVATION STRATEGIES

rearing habitat for 43% of the Sage-grouse in the Box Elder SGMA. Zones 1a and 1b are also important for protecting the habitat in areas 1c, 2 and 3 from catastrophic wildfire. In other words, controlling wildfires in zones 1a and 1b protects not only 43% of Sage-grouse in zones 1a and 1b, but also the 55% of Sage-grouse in zones 1c, 2 and 3. What this means is that protecting 98% of the birds can be achieved by reducing the number of large fires within the 226,765 acres designated as zone 1a and the 202,928 acres designated as zone 1b. In a triage situation, managing wildfires on the combined 429,693 acres of zones 1a and 1b are is a much more manageable task than attempting to control every fire on 1.5 million acres. Considering the fact that a small handful of fires in zones 1a and 1b in 2007 accounted for approximately half of the acreage burned in an 18-year period in Box Elder SGMA, the priority

system provides invaluable insight for improving rapid response strategies and enhanced suppression efforts in future fire seasons.

Conifer Removal and Prevention Strategies for Zones 1a and 1b

Prevention is an important tool to reduce the incidence of large wildfires. Pre-suppression strategies can dramatically reduce the incidence of large wildfires and the ability to suppress fires that do start in severe conditions. In 2008, the state of Utah responded to the wildfires of 2007 with funding for for an ongoing prevention and restoration program. Prevention is a critical part of the detailed wildfire amelioration strategy in zones 1a and 1b. Conifer removal, restoration and other prevention work in zones 1a and 1b are helpful to address the threat of wildfire by:

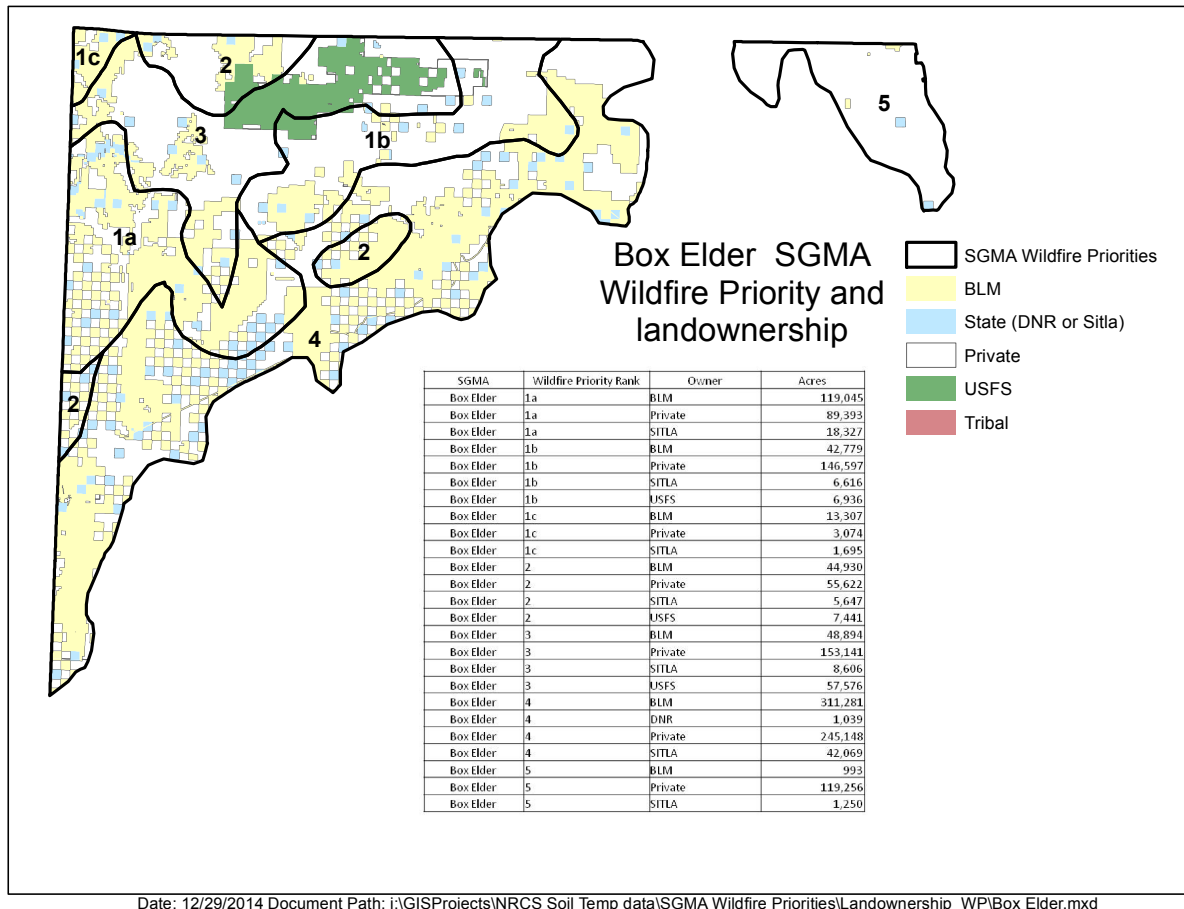


Figure 17-ownership of land can affect suppression efforts as well as the timing, funding and regulatory hurdles for conifer removal and other habitat restoration efforts.

UTAH SAGE-GROUSE CONSERVATION STRATEGIES

- (1) Reducing fuels loads which increase the likelihood of catastrophic wildfires;
- (2) Making it easier to suppress wildfires in severe conditions; and
- (3) Reducing the size and intensity of fires that do occur.

These programs have been extremely successful. Since 2007, almost 100,000 acres of conifer removal, invasive plant control and sage-grouse habitat restoration efforts have been implemented in the Box Elder SGMA. An additional 60,000+ acres of conifer removal is planned in Box Elder SGMA in the next few years. These projects increase the resiliency and redundancy of sage-grouse habitats, improve watersheds and mesic areas, remove vertical plant structures and reduce the threat of catastrophic wildfire. Many of these

projects are planned adjacent to existing Sage-grouse populations or in areas of important winter range. Since 2008, wildfire totals in Box Elder have dramatically improved. No wildfire has burned over 2,500 acres in the Box Elder SGMA since 2008. Just 4 fires have burned more than 1,000 acres since 2008. For more information on the science behind conifer removal and benefits to sage-grouse and their habitats, refer to the state of Utah's Sage-Grouse Conservation Strategies document on conifer removal.

Much of the habitat restoration efforts in the Box Elder SGMA occurs in zones 1a and 1b. Ownership of land in conifer removal areas affects whether funding availability, regulatory restrictions and NEPA assessments may delay or restrict conifer removal projects. For example, the fact that much of zone 1b is private land makes it

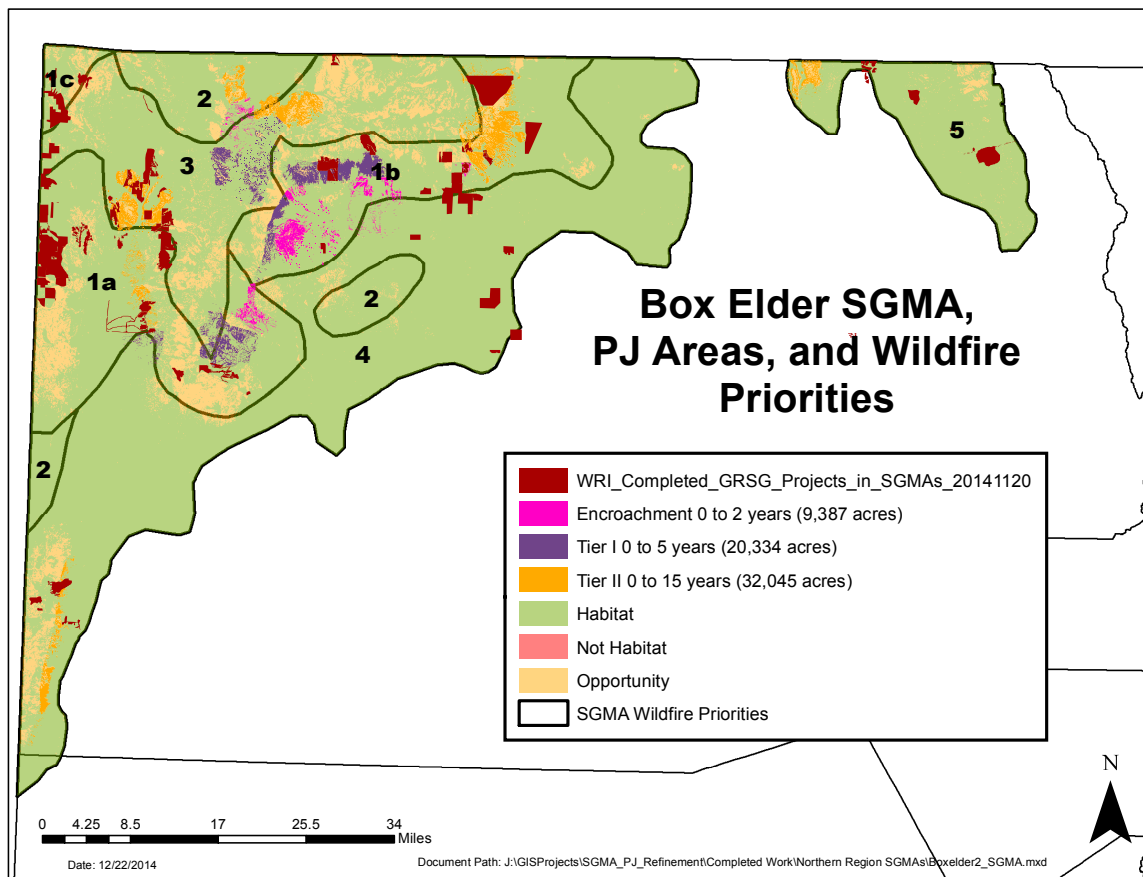


Figure 18 - Watershed restoration initiative projects totaling over 100,000 acres have been completed in Box Elder SGMA since 2006. Over 60,000 acres of conifer removal projects are planned in coming years to enhance grouse habitat and reduce the threat of catastrophic wildfire.

UTAH SAGE-GROUSE CONSERVATION STRATEGIES

much more likely that conifer removal can be implemented in the short term than area 1a which includes large portions of public lands managed by the Bureau of Land Management (BLM). The BLM is an important partner in Utah's watershed restoration initiative, however NEPA requirements and availability of funding can delay conifer removal projects by several months or even several years.

Box Elder Conclusion

Existing wildfire prevention, suppression and rehabilitation strategies have successfully addressed the threat of wildfire in most years within the Box Elder SGMA. However, in extreme fire conditions such as those experienced during the 2007 wildfire season, large fires can burn large amounts of acreage. These fires account for most of the acreage burned within important sage-grouse habitats within the Box Elder SGMA. To ameliorate the threat of wildfire in extreme fire conditions, the state of Utah has developed a priority system to inform prevention projects and rapid-response/suppression strategies. By utilizing priority system heightened protections for key

nesting/brood rearing and critical winter range for 98% of Sage-grouse in the Box Elder SGMA within areas have been designated as priority zones 1-3.

Prioritization is helpful to focus wildfire prevention and suppression strategies in at-risk areas within the Box Elder SGMA. For example, while the Box Elder SGMA covers 1.5 Million acres, protecting 98% of the birds can be achieved by reducing the number of large fires within the 187,000 acres designated as zone 1a and 191,000 acres designated as zone 1b. Quantification and spatially explicit threat analyses illustrate that Utah's priority system for preventive treatments and rapid response strategies in Box Elder SGMA can reduce the acreage lost to wildfire by up to 75% in areas which are key to survival of 98% of the birds in the Box Elder SGMA. By utilizing priority areas, the science and data inform wildfire suppression strategies in a manner that not only reflects likely conditions on the ground, but also informs strategies for significantly reducing the threat of wildfire to greater sage-grouse populations.



Hamlin Valley



Overview

Detailed conservation strategies for Hamlin Valley are much more straightforward than for the Box Elder. Priority zone 1 contains 100% of the nesting brood rearing and winter habitat in the Hamlin Valley SGMA. While Hamlin Valley covers 341,523 acres, priority zone 1 covers 158,065 acres. Between 0 and 22 wildfires occur annually within

priority area 1. However, most of these fires are quite small. In fact, less than 100 acres burns in zone 1 of Hamlin Valley in a typical year. However, in 2002, one fire burned 4,550 acres and in 2012, another fire burned approximately 8,500 acres. These two fires account for over 96% of the acreage burned in priority area 1 of Hamlin Valley. While wildfire is not a major concern within priority

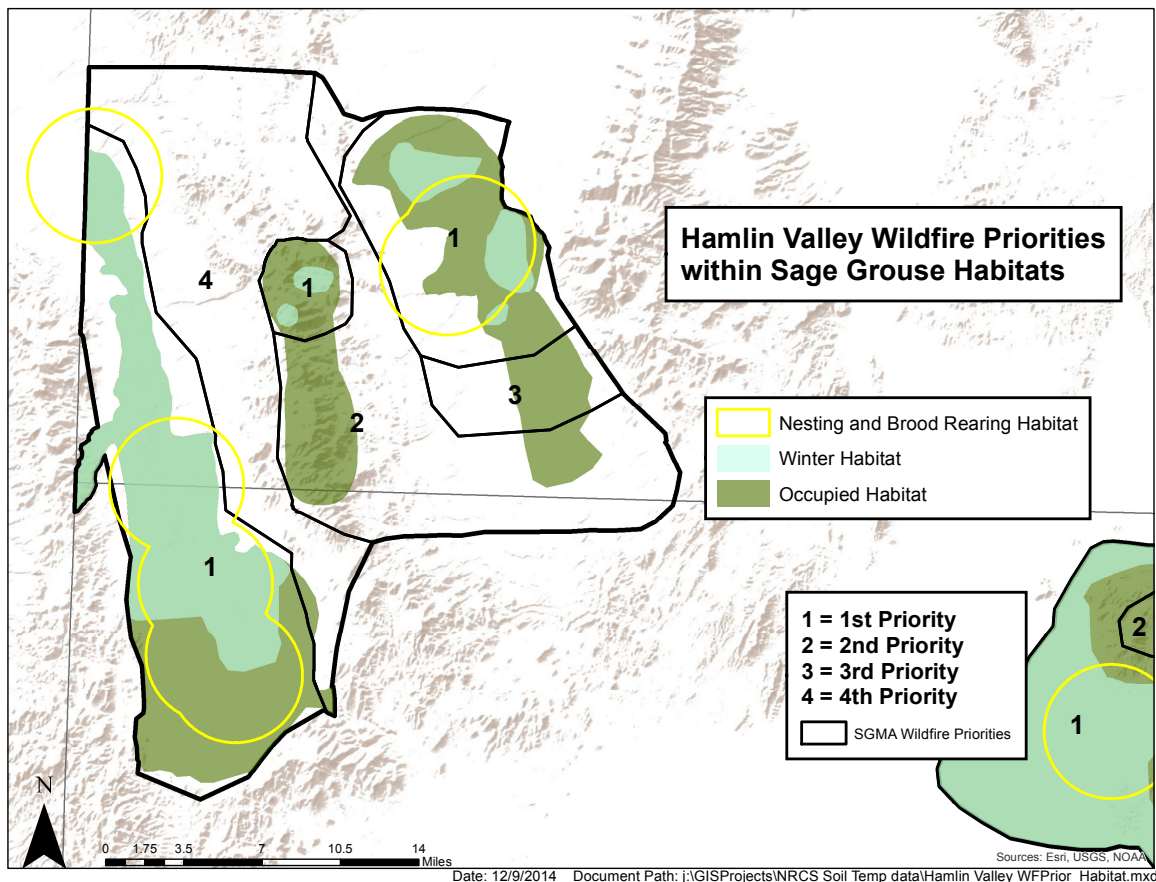


Figure 19 - 100% of leks, nesting brood rearing and most key winter habitat are located in zone 1. Zones 2 and 3 contain some general habitat as well as opportunity areas. Zone 4 is primarily non-habitat.

UTAH SAGE-GROUSE CONSERVATION STRATEGIES

zone 1, prioritization of zone 1 protects key habitat areas and provides an opportunity to reduce the incidence of large fires and overall acreage-burned within sage-grouse habitat in Hamlin Valley.

Zone 2 encompasses an area of general habitat between the populations on the east and western portions of the Hamlin Valley SGMA. In an 18 year

period from 1995-2012, there were 131 fires in priority area #2. However, soil temperature and moisture regimes and existing wildfire suppression efforts resulted just 340 acres burned in fire priority area #2. While area 2 contains some seasonal habitat, it primarily consists of conifer stands which do not provide important habitat for Sage-

grouse. Controlling wildfire in these areas is important to prevent catastrophic wildfires which could burn into priority area #1. Priority zone 2 also includes opportunity areas of possible habitat. Removal of conifers in these areas can increase the amount of available habitat for sage-grouse if conducted in areas adjacent to existing sage-grouse populations, with adequate water and other habitat characteristics. Similar projects in Utah are being utilized within months of restoration efforts.

Priority zone 3 and zone 4 had very few wildfires. Priority zone 3 had virtually no large fires in an 18 year period. Priority zone 4 represents non-habitat due to geophysical characteristics of this area.

Conifer removal strategies are planned to provide additional protections to sage-grouse

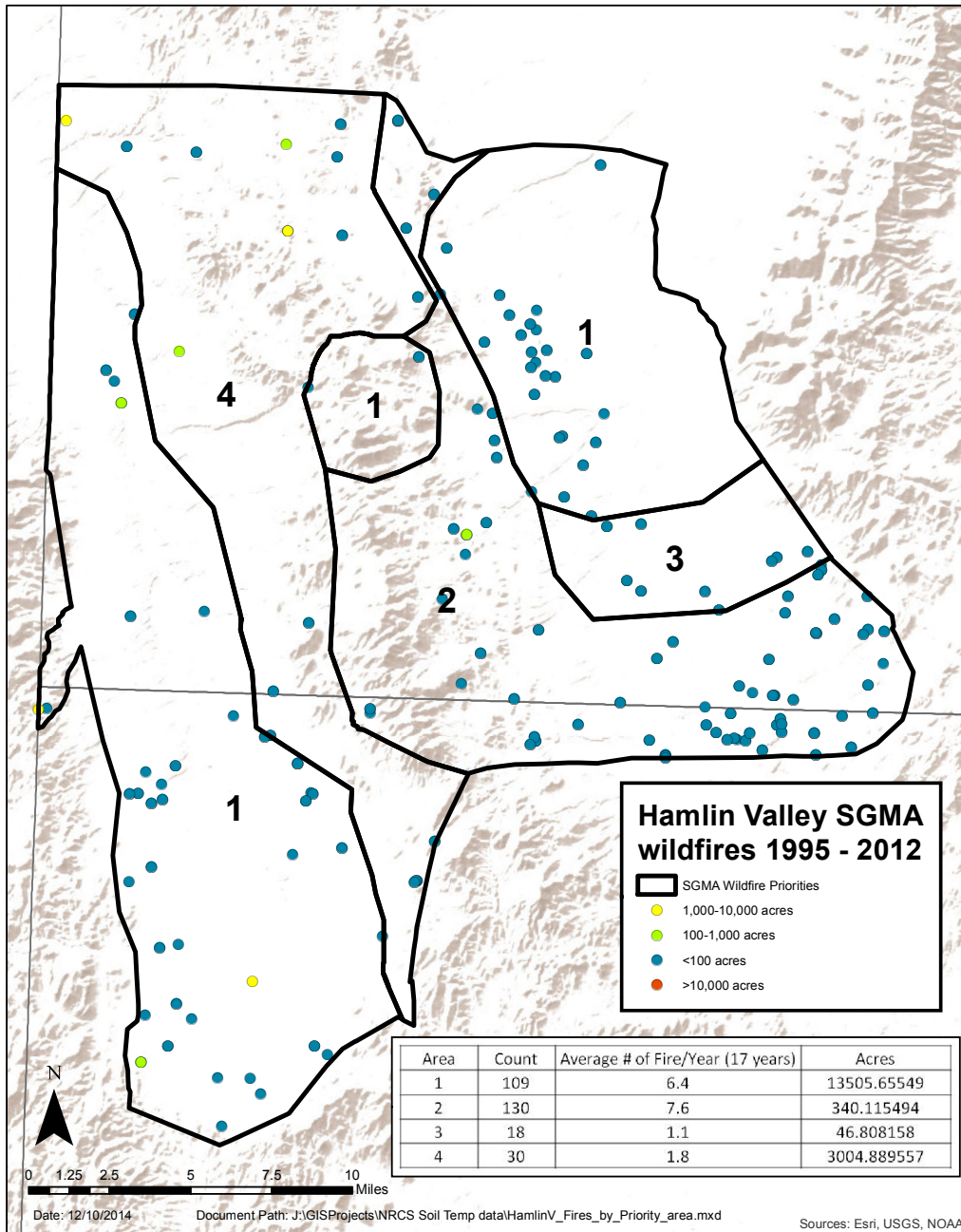


Figure 20 - By reducing the incidence of large fires in zones 1, acreage burned can be improved by over 90% in areas which hold leks and the nesting/brood rearing habitat for 100% of Sage-grouse in the Hamlin Valley SGMA.

habitat in Hamlin Valley. Areas planned for conifer removal are adjacent to sage-grouse leks, nesting brood rearing and important winter range. Typical of desert shrub habitats, the areas suitable for sage-grouse tend to be fairly localized. Removing conifers from areas adjacent these localized habitats helps provide buffers further insulating these habitats from the threat of wildfire. Conifer removal and other habitat restoration efforts can also improve the quality of the habitat for sage-grouse and its resiliency to wildfire. 269,595 acres or 79% of the Hamlin Valley SGMA are managed by the BLM. This means that NEPA, funding and regulatory restrictions will need to be addressed as part of these conifer removal efforts.

Hamlin Valley Conclusion

Spatial threat analysis illustrates that utilizing a priority system for prevention treatments and rapid response strategies in difficult fire years can reduce the acreage burned by wildfire by up to 95% in the areas which are key to survival of 100% of the birds in the Hamlin Valley SGMA. Proactive conifer removal and habitat restoration efforts suggest that ameliorating the threat of wildfire in Hamlin Valley should be possible.

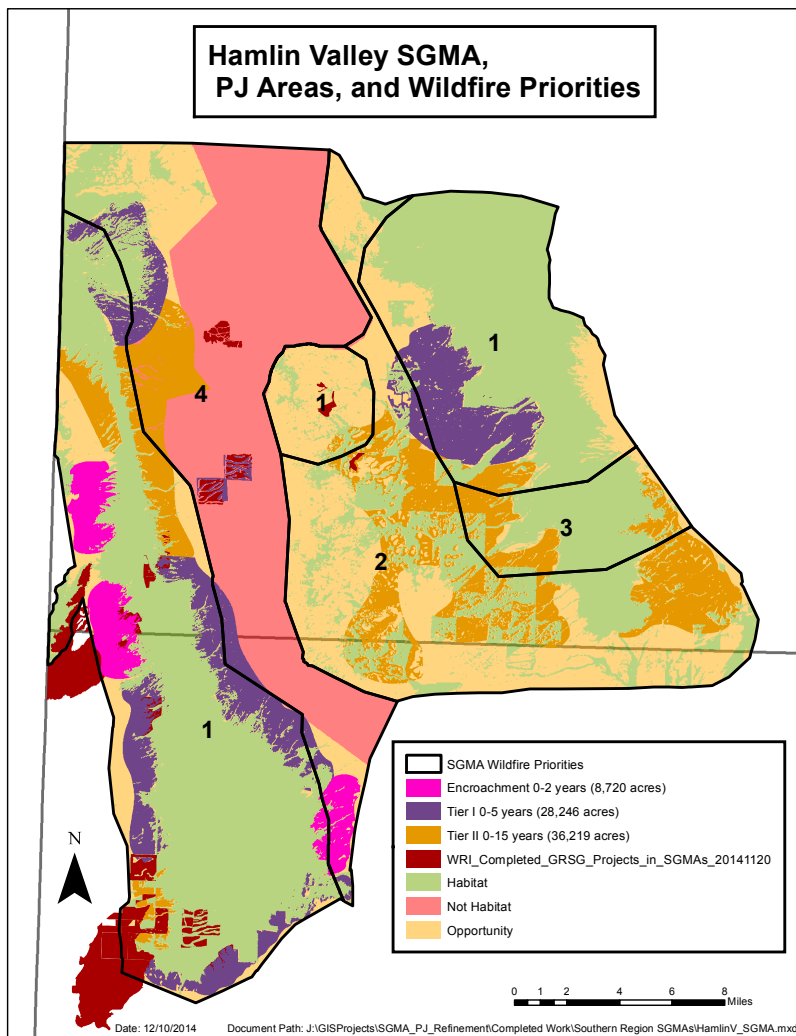


Figure 21-conifer removal in areas of leks, nesting/brood rearing habitat and key winter range are a priority in Hamlin Valley.

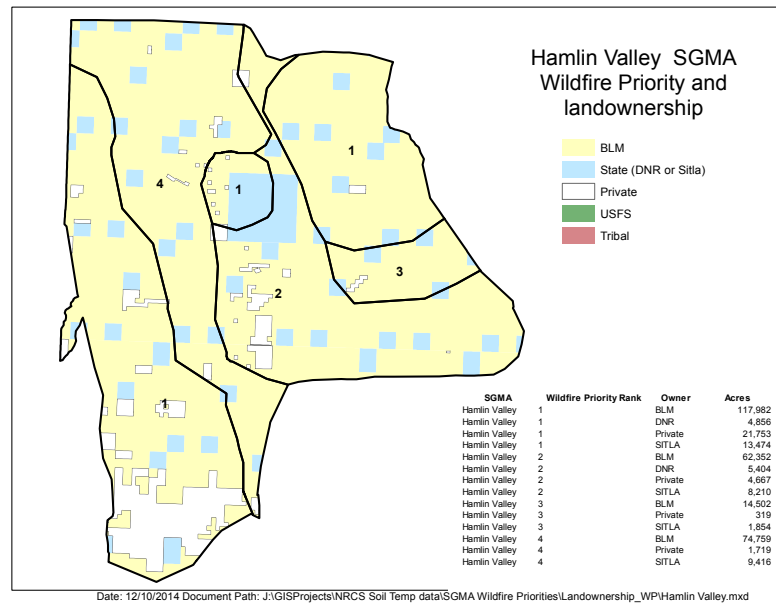


Figure 22-land managed by the Bureau of Land Management comprise the majority of the Hamlin Valley SGMA.

Bald Hills

Overview

In 2007, the Milford Flats Fire burned 357,000 acres in the area adjacent to Bald Hills SGMA. This was one of the largest recorded fires in Utah history. The Milford Flats Fire underscores the importance of prevention, suppression and rehabilitation efforts. Like other SGMA's which comprise desert shrub ecosystems, Sage-grouse populations in the Bald Hills SGMA are fairly localized in areas of suitable habitat. 100% of leks, nesting brood rearing and the key winter habitat are located in zones 1 and 2. Zone 1 contains most of the important winter range, leks, nesting brood rearing habitat for most of the Sage-grouse in Bald Hills. Zone 2 contains

nesting brood rearing habitat for the remainder of the Sage-grouse in the Bald Hills SGMA. For this reason, fire suppression is prioritized for both zones 1 and 2, with a higher priority on zone 1 in difficult triage situations. This does not mean that zone 2 is not important, it simply reflects the reality that a large fire in zone 1 is more likely to impact sage-grouse populations than wildfire in zone 2.

Zone 3 also contains some general sage-grouse habitat along with areas of non-habitat. Zone 4 is predominantly marginal habitat or non-habitat for Sage-grouse. While zones 3 and 4 are prioritized for wildfire treatment, they are given a lower priority than zones 1 and 2 due to the lack of leks, nesting/brood rearing and key winter habitat.

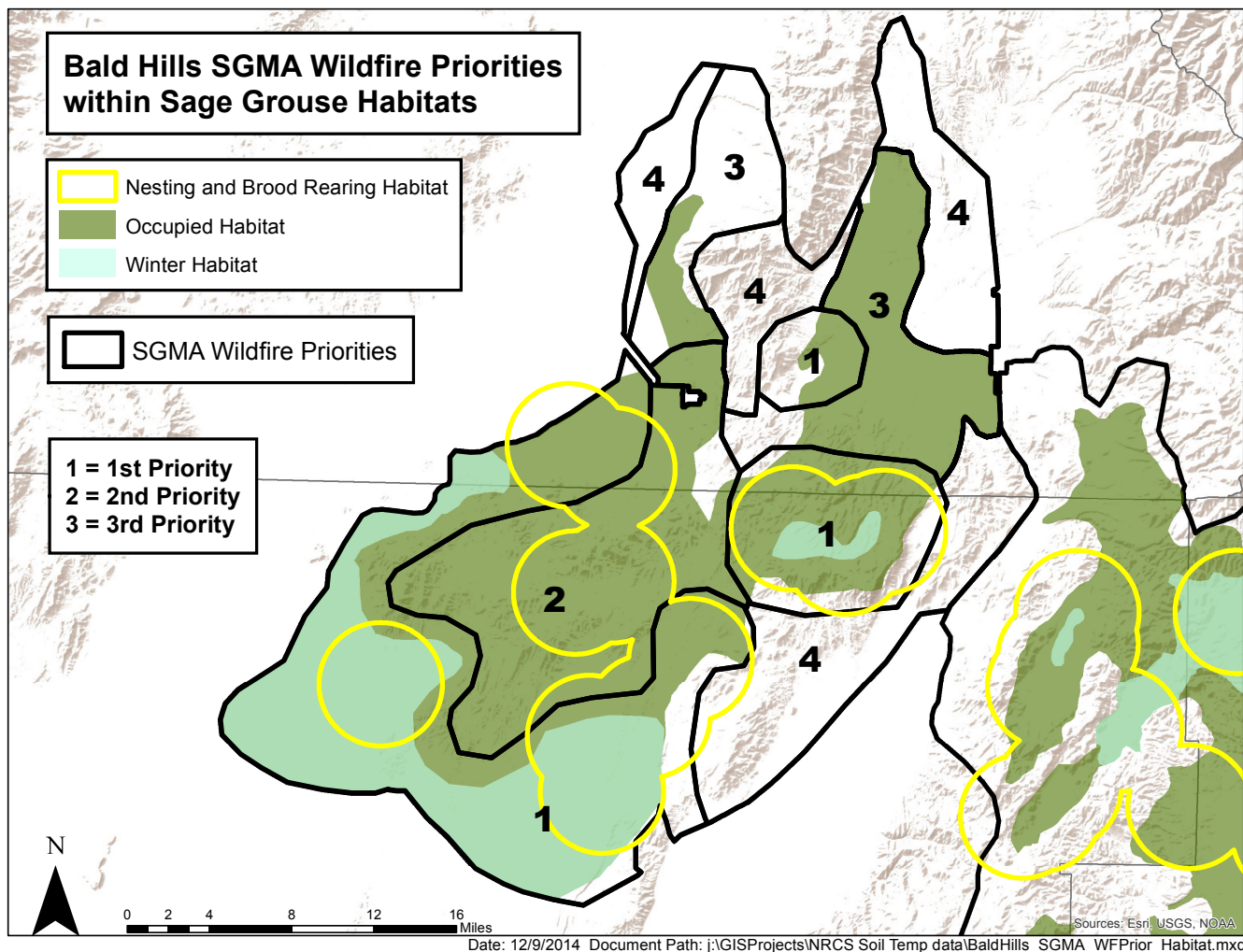


Figure 23 - 100% of leks, nesting brood rearing and most key winter habitat are located in zones 1 and 2. A greater percentage of leks are found in zone 1 than zone 2 along with key winter habitat. Zones 3 contains no leks but some general habitat. Zone 4 is primarily marginal habitat or non-habitat.

Detailed Analysis

The average number of wildfires is higher in the Bald Hills SGMA than any of the other prioritized SGMA's for wildfire treatment. In most years, these fires do not become a problem. Even in difficult wildfire years, most of the fires are suppressed without burning large acreage. However, a handful of large fires account for most of the acreage burned in zones 1 and 2. Six fires in zone 1 and five fires in zone 2 account for over

87% of the acreage burned by wildfire in zones 1 and 2 over the 18 year-period from 1995-2012. What this means is that by reducing the incidence of large fires in zones 1 and 2, the threat of wildfire can be reduced by up to 85% in areas which hold leks and nesting/brood rearing habitat for 100% of Sage-grouse in the Bald Hills SGMA. This will also protect the key winter habitat in the Bald Hills SGMA.

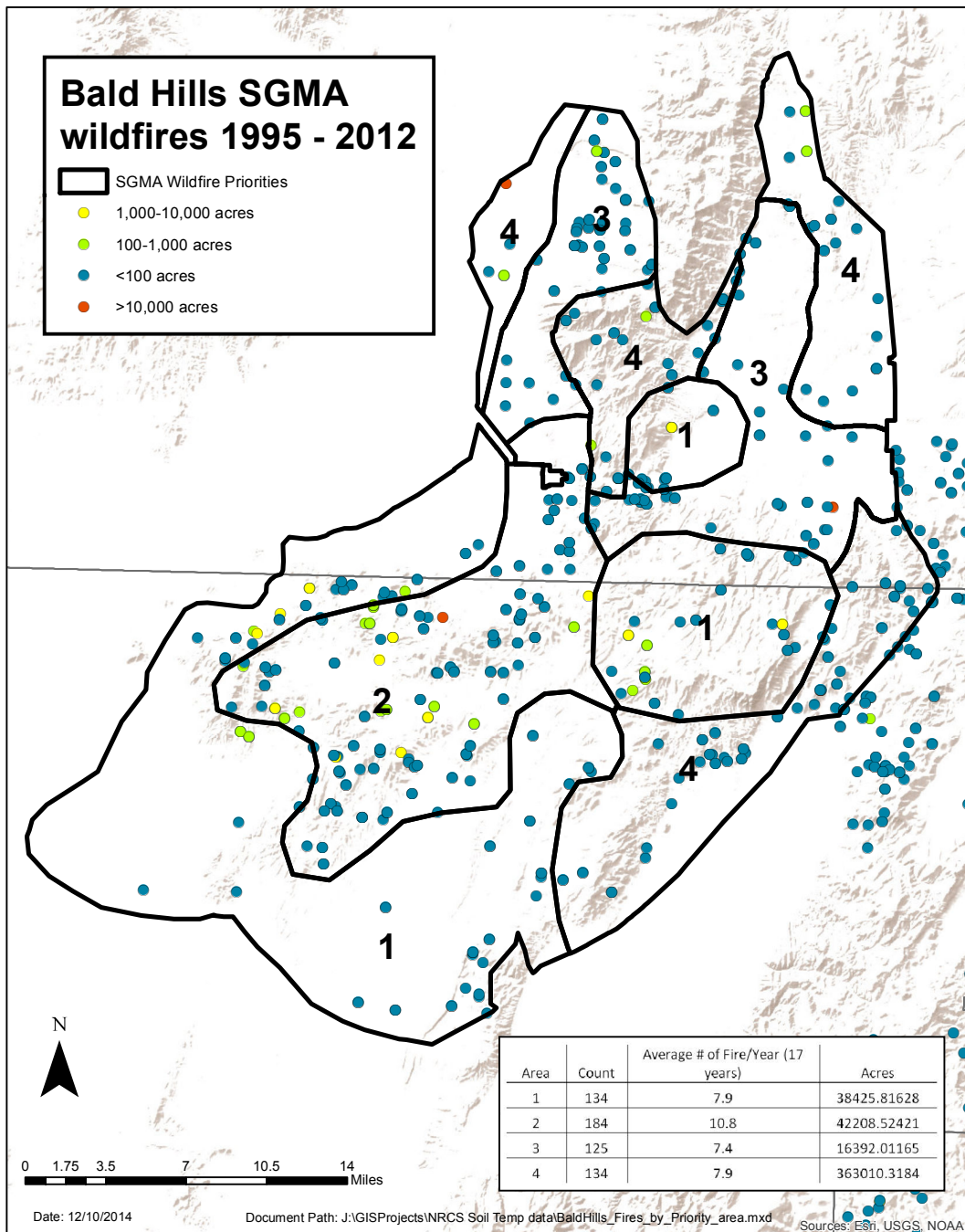


Figure 24 - By reducing the incidence of large fires in zones 1 and 2, acreage burned can be improved by up to 85% in areas which hold leks and the nesting/brood rearing habitat for 100% of Sage-grouse in the Bald Hills SGMA.

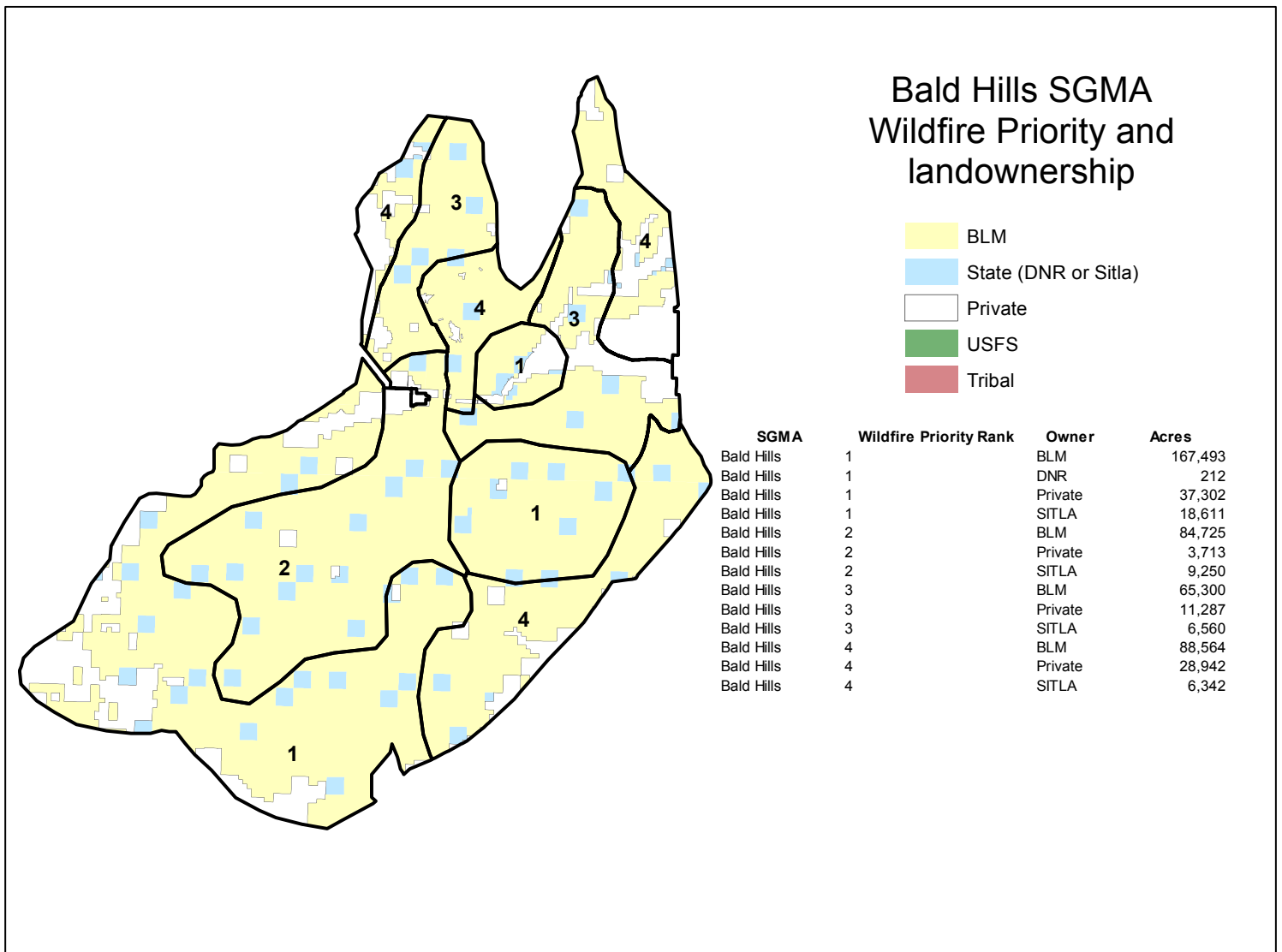
The Relevance of Land Ownership

Most of the large fires within the Bald Hills SGMA occur on land managed by the Bureau of Land Management. This is likely the result of a variety of factors. First, 77% of the acreage within the Bald Hills SGMA is managed by the BLM. Additionally, while 8% of the acreage is owned by the state of Utah, most of the state land is landlocked by BLM controlled land. Additionally, higher elevation areas are largely BLM controlled there may be a higher number of lightning strikes. Whatever the cause, most of the wildfires and most of the large fires occur on BLM land.

Because much of the Bald Hills SGMA is managed by the U.S. Bureau of Land Management, coordination on conifer removal, fire-breaks, green stripping and suppression efforts will be important. While past wildfire has already removed large areas of conifer, mechanical removals in areas adjacent to key leks, nesting/ brood rearing and winter habitat is still needed.

Prevention is Key

Because of the large number of fires and the fact that difficult wildfire conditions are not uncommon, key pre-suppression strategies can be helpful. Conifer removal strategies, fire breaks and green



Date: 12/10/2014 Document Path: J:\GISProjects\NRCS Soil Temp data\SGMA Wildfire Priorities\Landownership_WP\Bald Hills.mxd

Figure 25 - The majority of the Bald Hills SGMA is managed by the Bureau of Land Management (BLM). State land is landlocked within BLM acreage. Because most of the acreage burned occurs in these areas, coordination will be needed to address the threat of wildfire within the Bald Hills SGMA.

stripping not only are useful to aid in suppression efforts, they can help prevent fires from affecting the most important habitats for Sage-grouse in the Bald Hills SGMA. As previously discussed, regulatory hurdles such as NEPA assessments and other approvals can delay the timing and possibility of pre-suppression treatment projects. BLM has been implementing fire breaks and green

stripping in past several years. A map showing conifer removal strategies is depicted below. A comparison with leks and nesting/brood rearing habitat shows the importance of conifer removal to reduce the incidence and intensity of large fires in these areas.

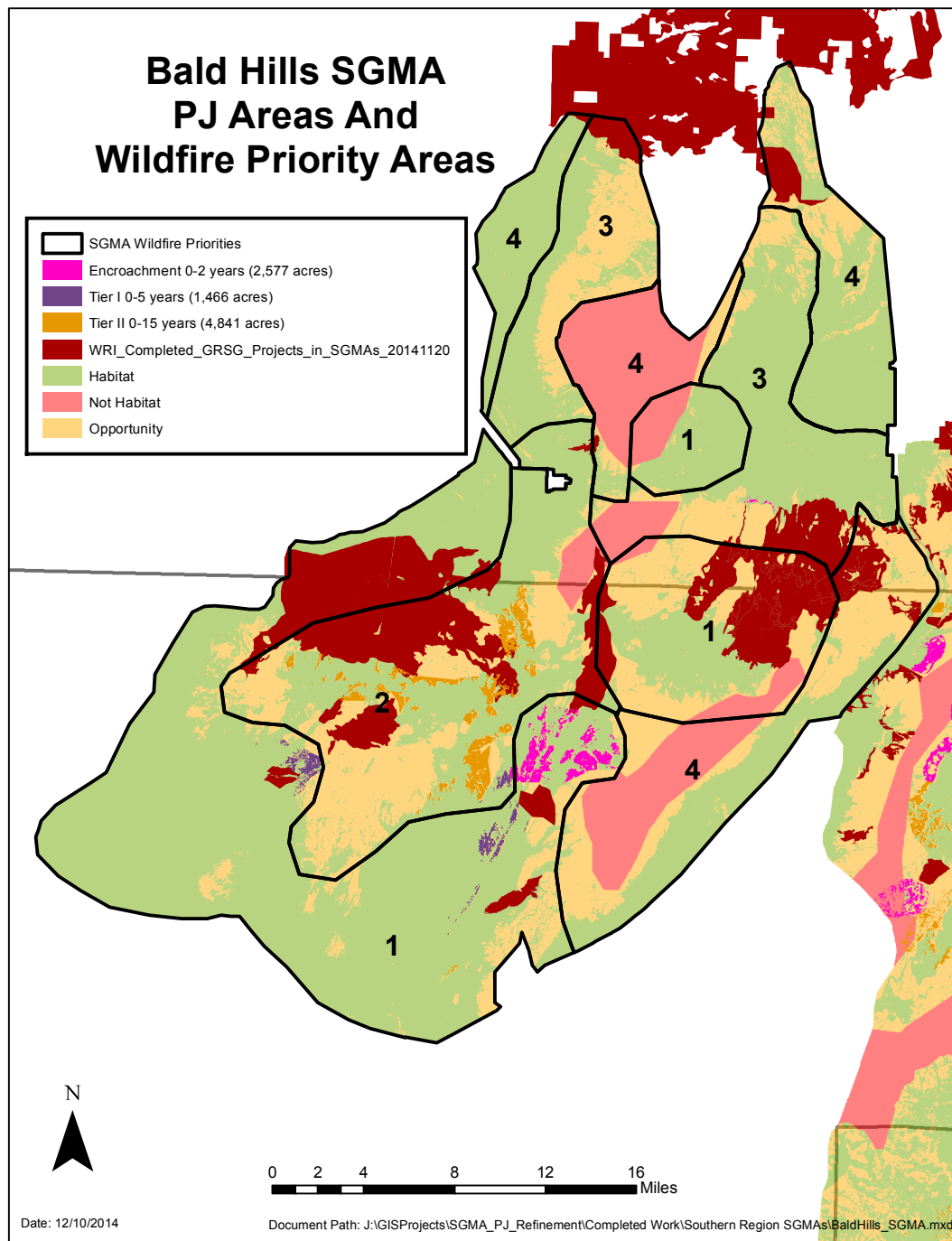


Figure 26 - conifer removal in areas of leks and nesting/brood rearing habitat are helpful to protect Sage-grouse populations in the Bald Hills SGMA.

Sheep Rock Mountains

Wildfire is not a major threat to Sage-grouse populations and core habitat within the Sheep Rock Mountains SGMA. 100% of leks, nesting/brood rearing habitats and key winter range is located within the 172,459 acres comprising zone 1. The remainder of the general winter habitat is found in zone 2.

From 1995-2012, wildfires burned 1,598 acres in zone 1. This is an average of less than 100 acres per year. This is largely a product of soil/temperature moisture types, elevation and vegetation within zone 1. Existing wildfire control

efforts within zone 1 are sufficient to maintain wildfires within acceptable thresholds.

While wildfires burned a higher number of acres within zone 2, the large amount of general winter habitat within zone 2 suggests that the existing level of wildfire should not be limiting. Nevertheless, by prioritizing wildfire control in zone 2, enhanced prevention and suppression strategies could substantially decrease the number of acres burned. While 31,250 acres burned in zone 2 from 1995-2015, two fires in 1998 of 12,894 acres and 13,927 acres accounted for 86% of acres burned. These fires

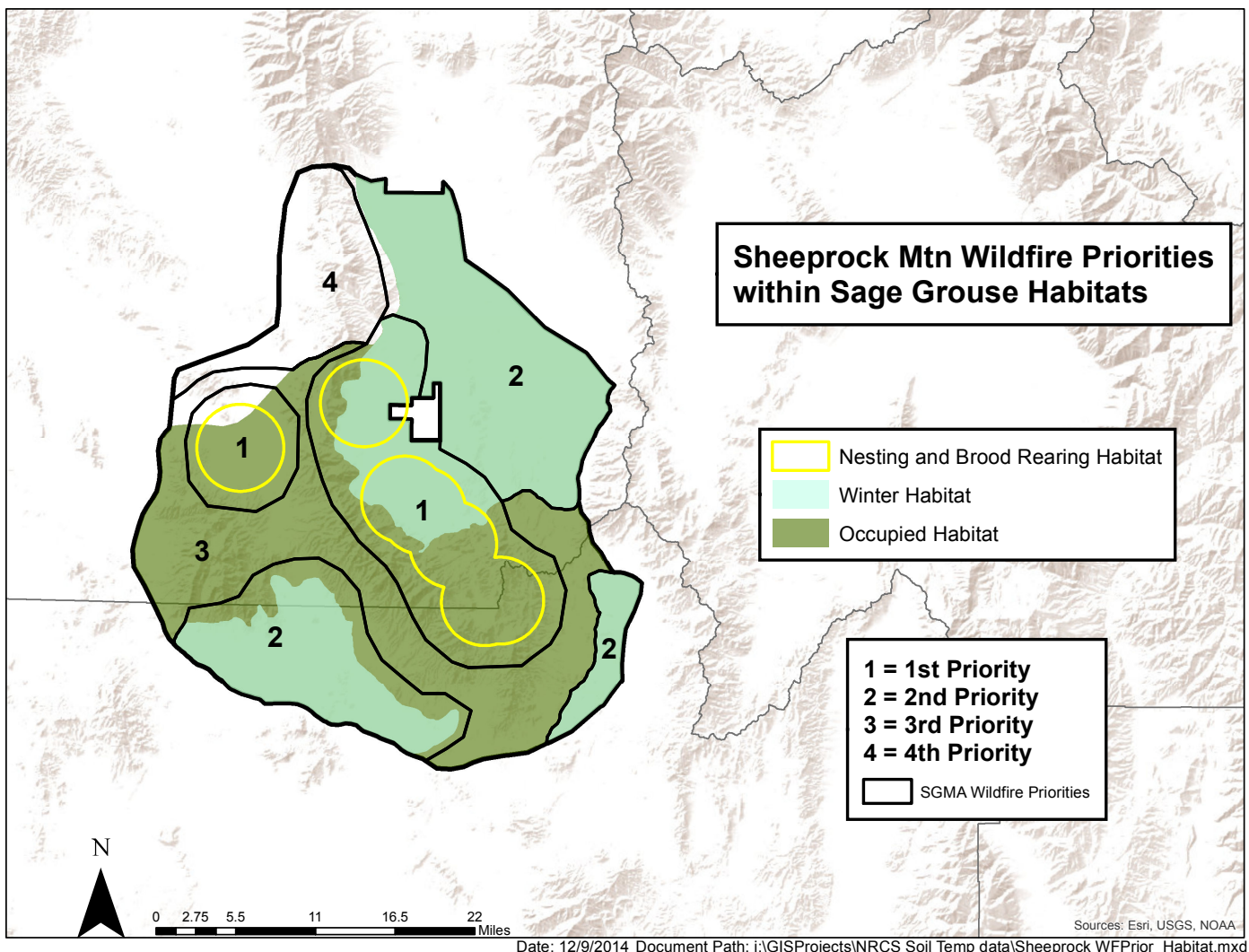


Figure 27 - 100% of Sage-grouse leks and nesting/brood rearing habitat are located within the priority zone 1 within the Sheep Rocks SGMA. The low incidence of wildfire and lack of large wildfires illustrate that existing habitat should be sufficient to protect Sage-grouse populations in this SGMA.

were not in areas which would have a substantial impact on Sage Grouse populations. Nevertheless, prevention efforts including conifer removal and enhanced suppression strategies should be able to reduce the impact of wildfires within the Sheep Rock Mountain SGMA. An additional 30,435 acres of conifer removal work is

planned in Sheep Rock Mountains SGMA in the next few years. Wildfire is not a major threat in zones 3 and 4. Since 1995-2012, 3093 acres has burned in zone 3, while 2,892 has burned in zone 4. Because these areas contain general habitat, opportunity areas and non-habitat, it makes sense to prioritize these areas behind areas 1 and 2.

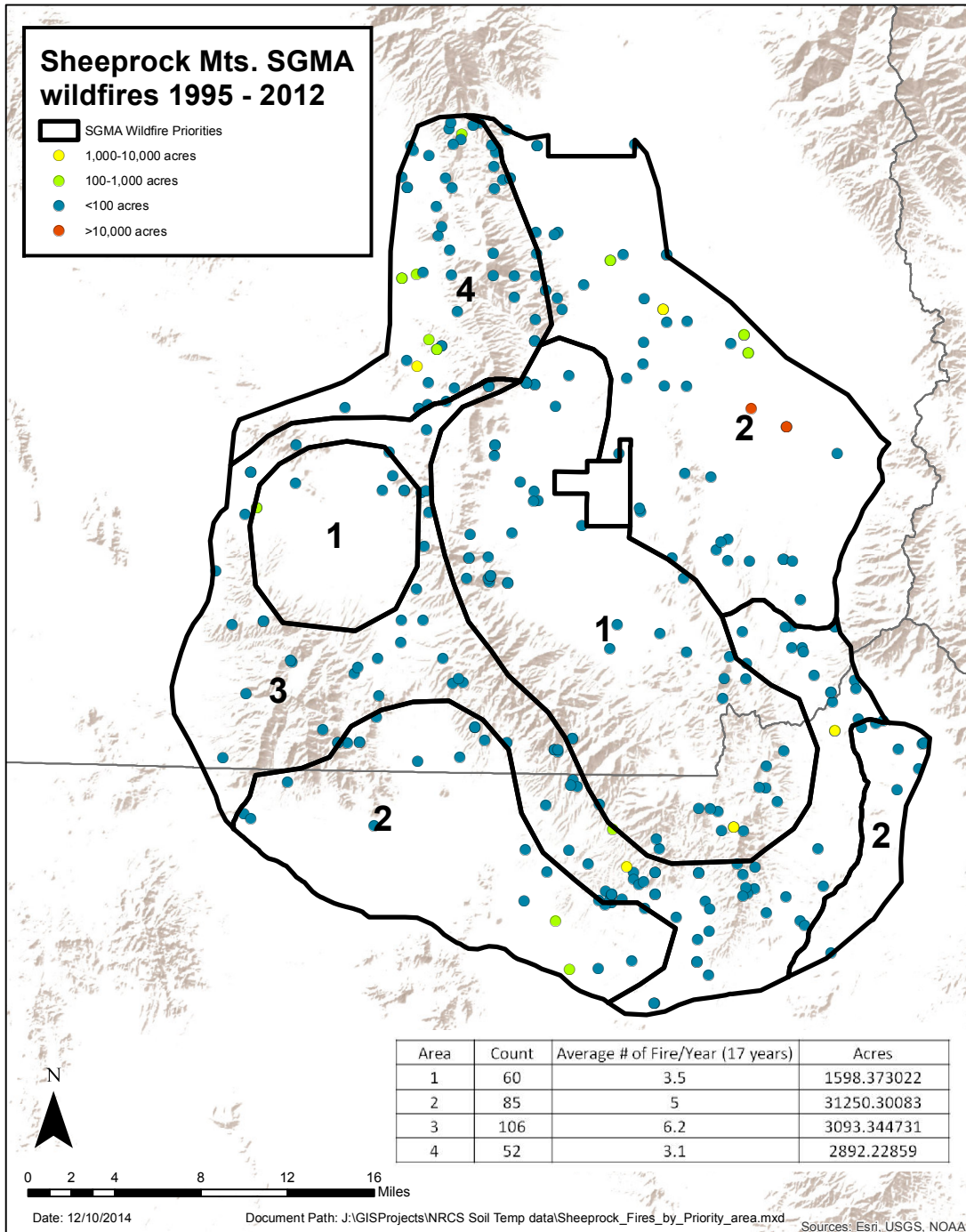


Figure 28 - existing wildfire control efforts are effectively controlling wildfires within priority zone 1 which contains 100% of leks and nesting/brood rearing for the Sheeprock SGMA. Only 1,598 acres burned from 1995-2012 in zone 1 and most of this occurred in one fire.

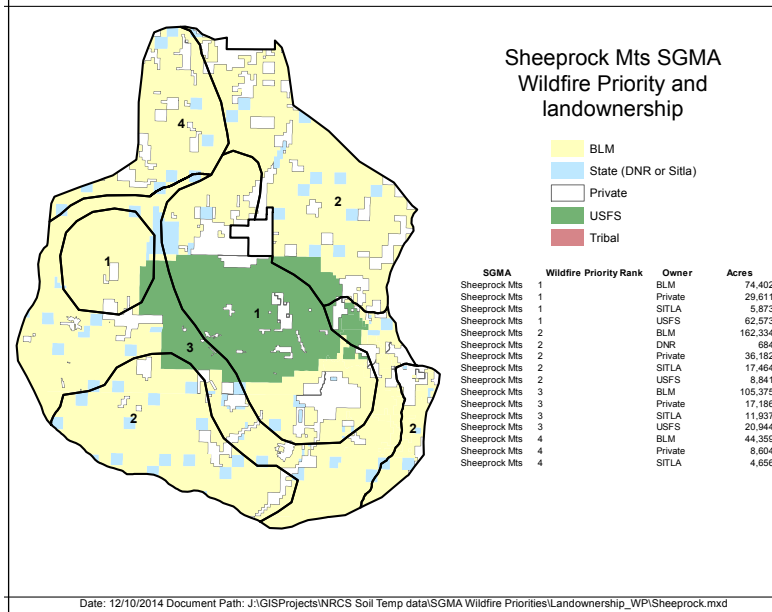
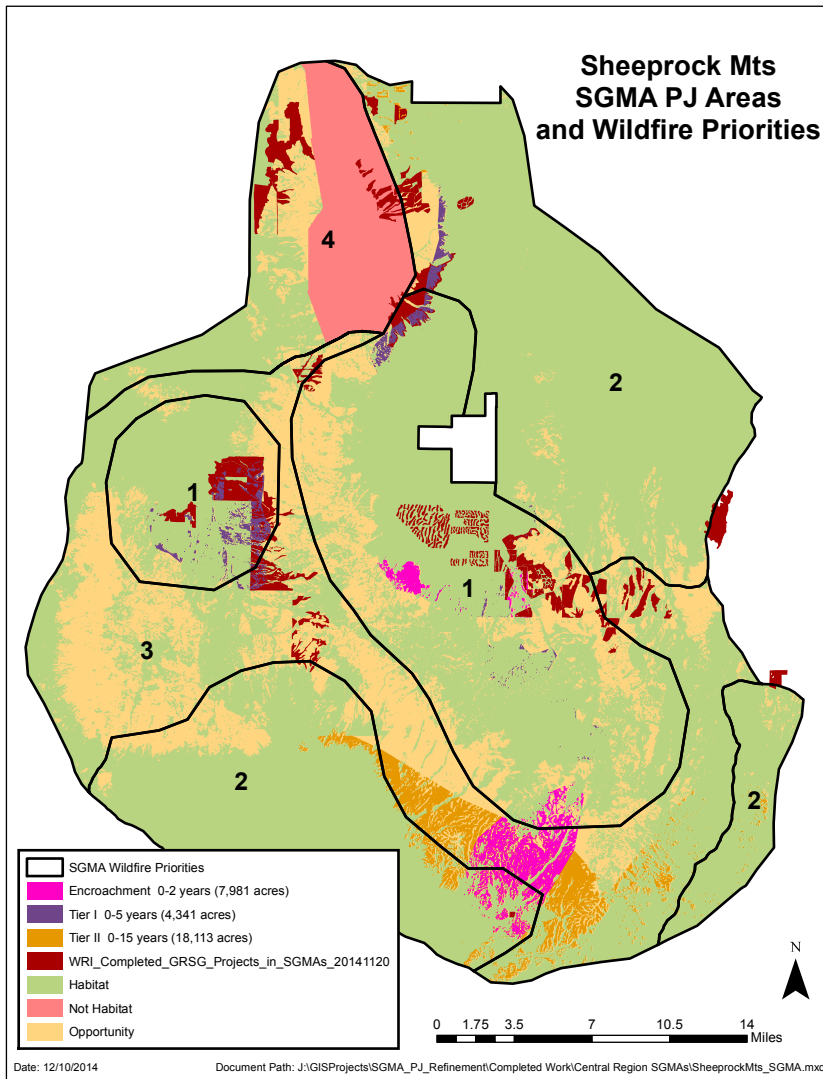


Figure 30 - land managed by the Bureau of Land Management and forest service comprise the majority of the Sheeprock SGMA.

Figure 29 - conifer removal in areas of leks and nesting/brood rearing habitat are helpful to protect Sage-grouse populations in the Sheeprock SGMA. These projects also increase available habitat in key areas.

UTAH SAGE-GROUSE CONSERVATION STRATEGIES

Ibapah

Wildfire is not a serious threat within the Ibapah SGMA. In fact, Ibapah averages less than one fire per year in the total SGMA. While there are no fires many years, one year had three fires, including two fires in one day.

Like other SGMA's containing primarily desert shrub habitat, Sage-grouse populations and core sage-grouse habitat in the Ibapah SGMA are quite localized. In point of fact, 100% of leks, nesting/brood rearing and key winter habitat is contained within the 51,299 acres zone 1. Soil and

temperature regimes within portions of the Ibapah SGMA suggest that providing enhanced prioritization of Ibapah SGMA makes sense.

Conifer removal is an important strategy for further reducing the threat of large wildfires within the Ibapah SGMA. 3,881 acres of conifer removal are planned in coming years, much of this occurs within zone 1. Upon completion of these conifer removal project very little conifer remains within zone 1. This should further reduce the likelihood of large fires while also making fires easier to suppress when they do occur.

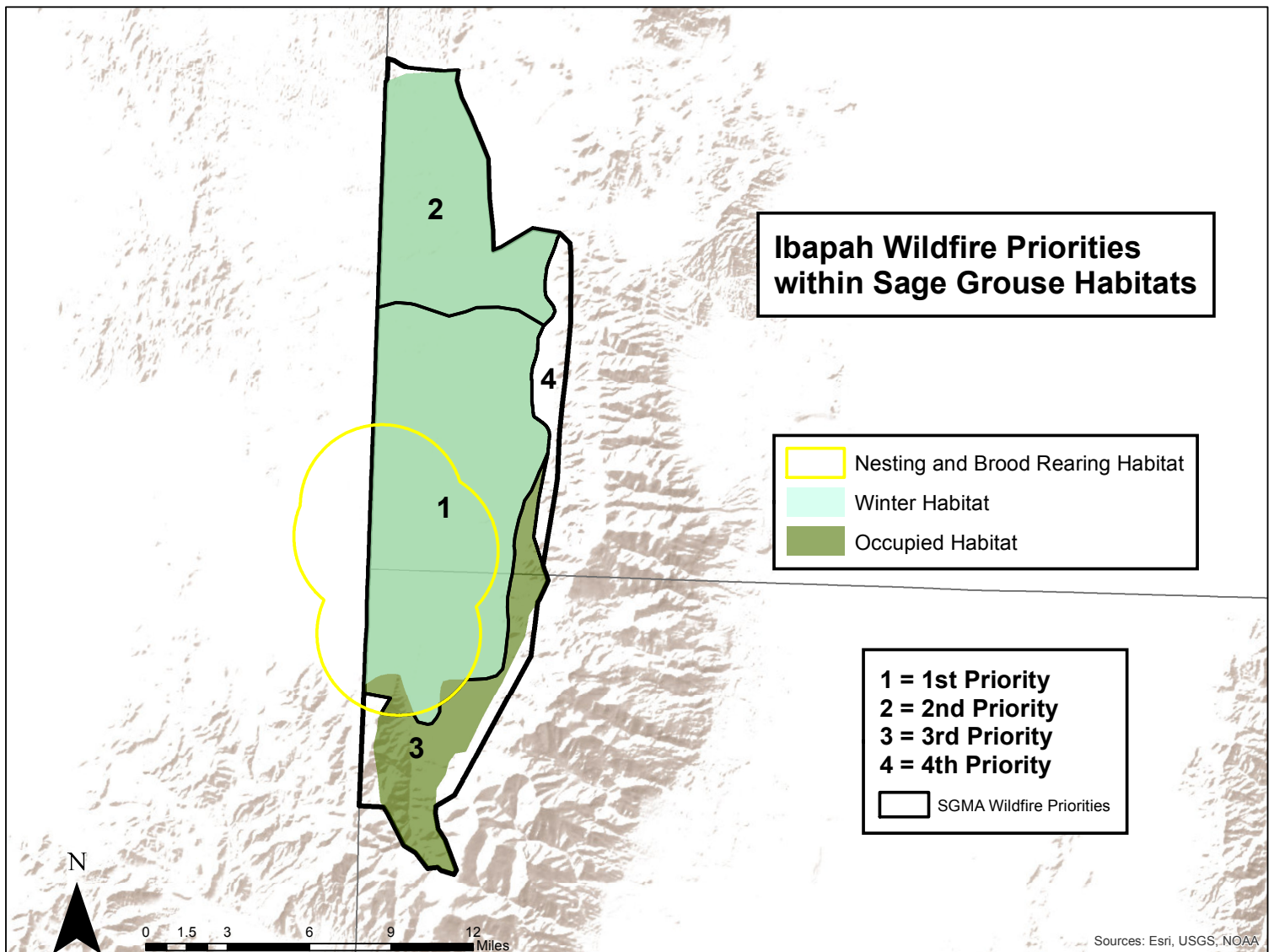


Figure 31 - 100% of Sage-grouse leks and nesting/brood rearing habitat are located within the priority zone 1 within the Ibapah SGMA. The low incidence of wildfire and lack of large wildfires illustrate that existing habitat should be sufficient to protect Sage-grouse populations in this SGMA.

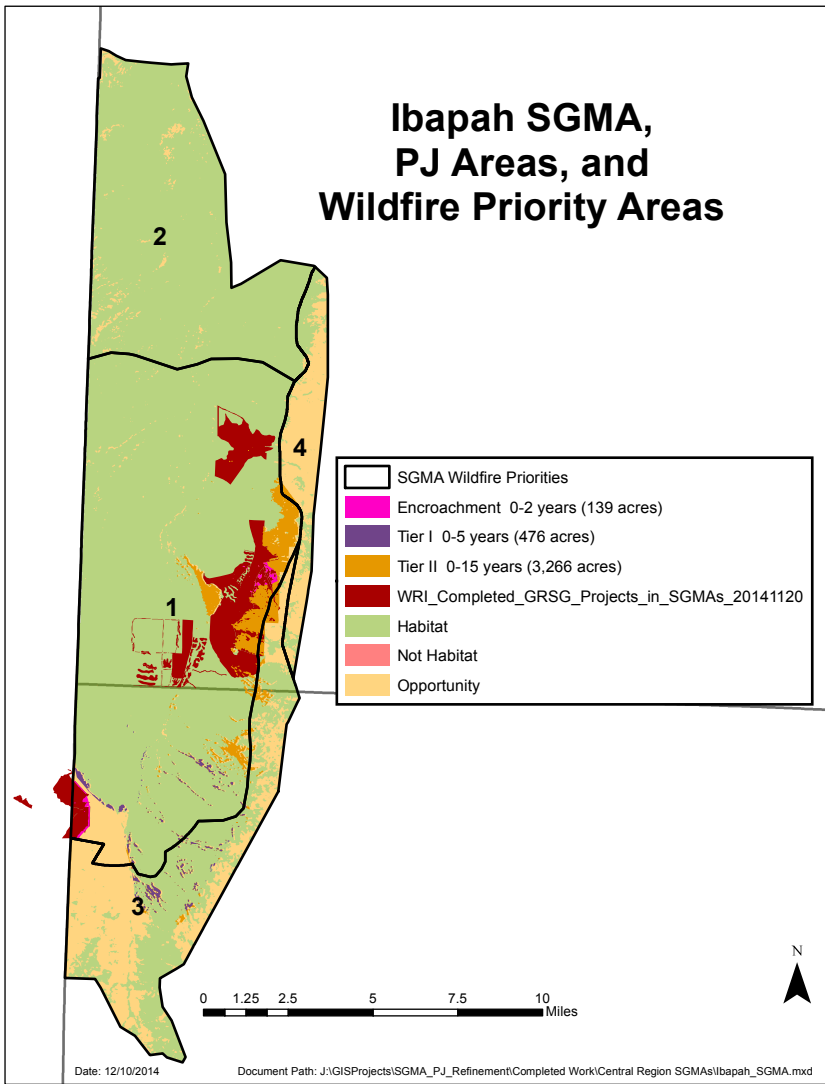


Figure 32 - conifer removal in areas of leks and nesting/brood rearing habitat are helpful to protect Sage-grouse populations in the Ibapah SGMA. These projects also increase available habitat in key areas.

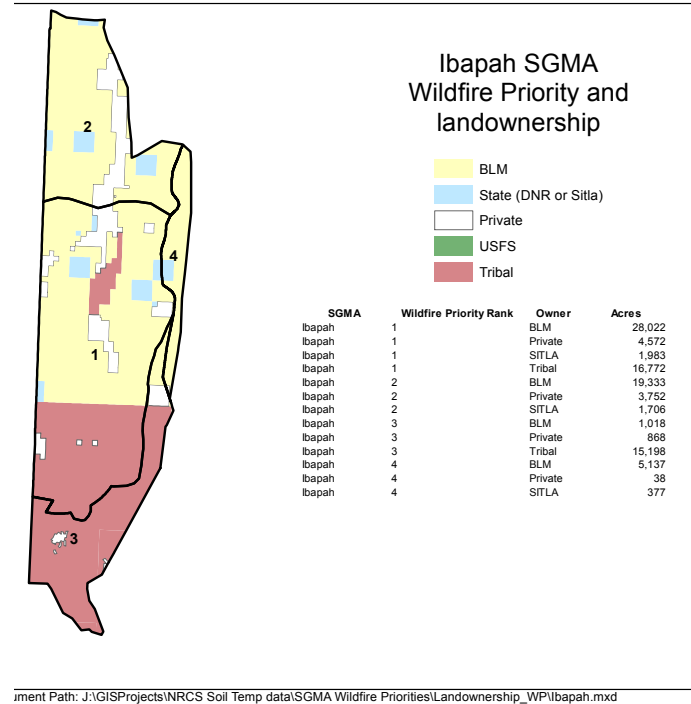
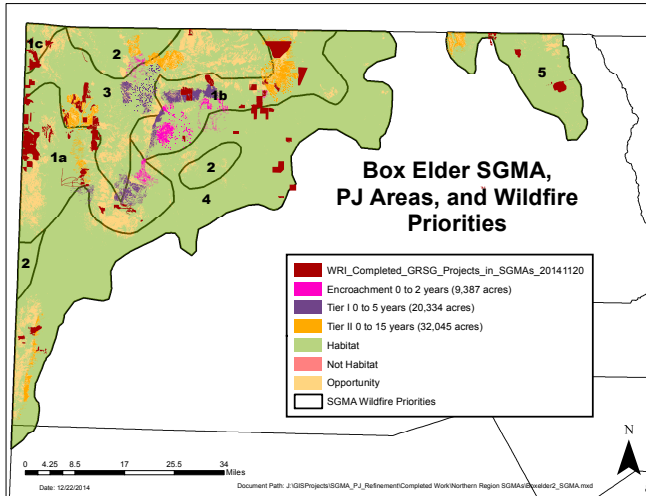


Figure 33 - The majority of the Ibapah SGMA is managed by the Bureau of Land Management (BLM) with most of the southern portion being Tribal land. Coordination will be helpful for implementation of conifer treatment and fire control efforts within the Ibapah SGMA.

Conclusion Conservation for Long-Term

The following is a brief overview of habitat enhancement and wildfire prevention strategies for each Utah SGMA:

Box Elder - Highest Priority

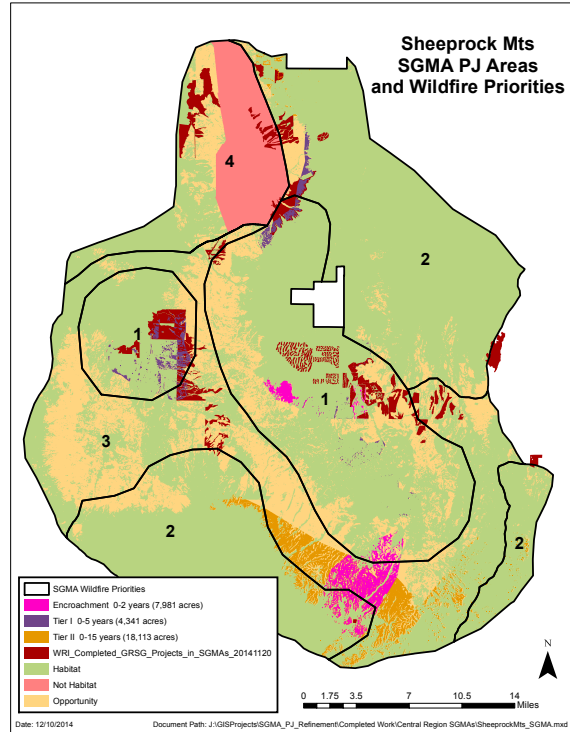


Past habitat work/conifer removal: 91,185 acres

Projected work to be completed in next 10-15 years:
61,766

Total Habitat Restoration: 152,951 acres

Sheep Rock Mountains - Elevated Priority

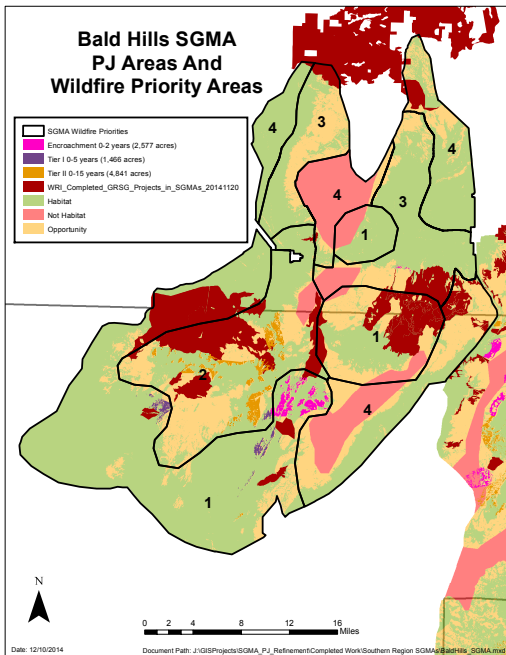


Past habitat work/conifer removal: 22,515 acres

Projected work to be completed in next 10-15 years:
30,435

Total Habitat Restoration: 52,950 acres

Bald Hills - Highest Priority



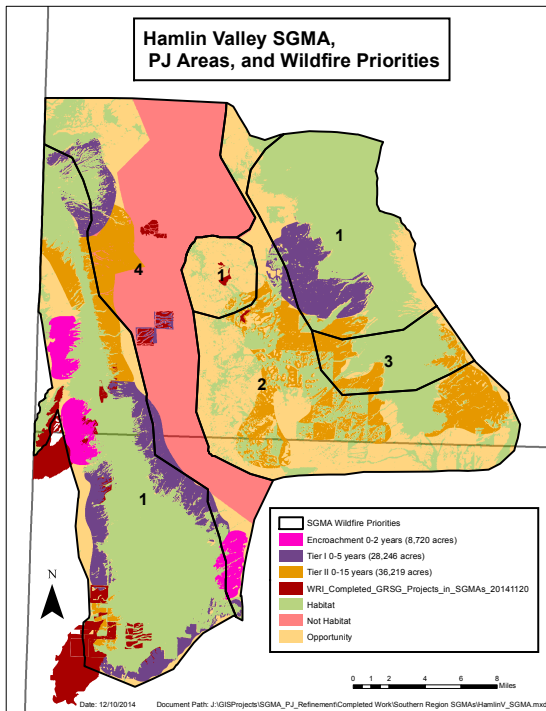
(Bald Hills Continued)

Past Habitat work/conifer removal: 68,799 acres

Projected work to be completed in next 10-15 years:
8,884 acres

Total Habitat Restoration: 77,683 acres

Hamlin Valley - Elevated Priority

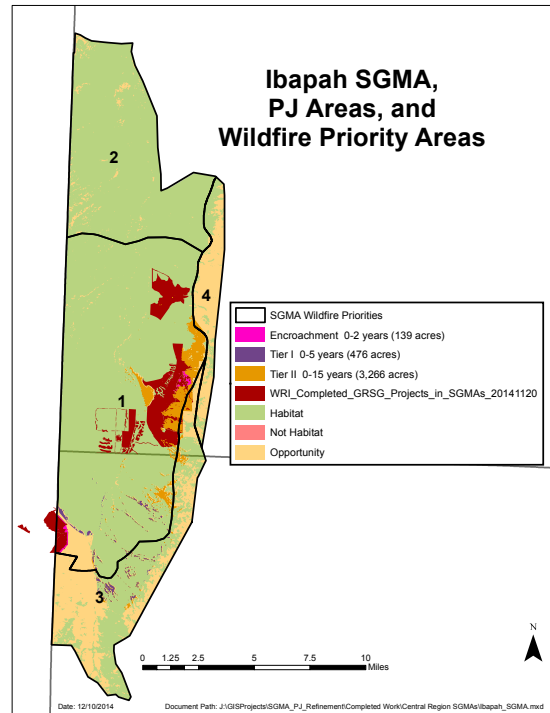


Past habitat work/conifer removal: 9,839 acres

Projected work to be completed in next 10-15 years:
73,185 acres

Total Habitat Restoration: 83,024 acres

Ibapah - Elevated Priority



Past Habitat Work/Conifer Removal: 7,413 acres

Projected work to be completed in next 10-15 years:
3,881

Total Habitat Restoration: 11,294 acres

Conclusion

While wildfire is a natural occurrence in Western landscapes, changes in wildfire frequency and severity are a concern for Greater Sage-grouse. In Utah, wildfire is primarily focused on five of Utah's SGMAs which hold 26% of the Sage-grouse in the state. In other words, the majority of Sage-grouse are not in high risk wildfire areas. In SGMAs which are given an elevated priority, Utah's detailed Sage-grouse conservation strategies for wildfire address these threats through implementation of proven prevention, suppression and rehabilitation solutions. State and federal partners in the state of

Utah have demonstrated a track-record of landscape scale prevention and rehabilitation projects to address the threat of wildfire. Since 2006, more than 500,000 acres of sage-grouse habitat restoration projects have been completed. Enhanced suppression strategies can further ameliorate the threat of wildfires in these SGMAs. This will be an area of focus particularly in Box Elder and Bald Hills where protection from wildfires are at the highest priority as well as Ibapah, Hamlin Valley and Sheep Rock Mountains.

Sources: [NRCS, UT DWR]